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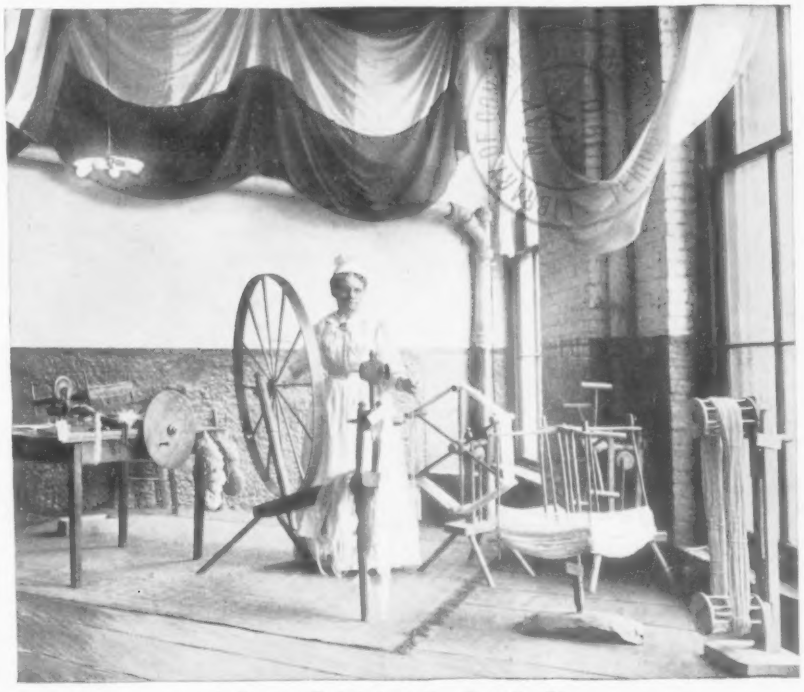

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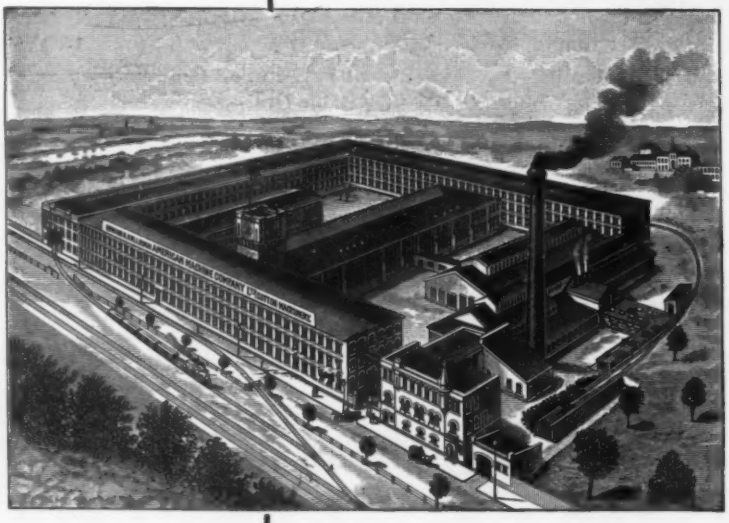

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VOL. 39 (NEW SERIES.) May, 1910 No. 2

Monthly Comment.

The Invisible Supply of Cotton.

The census of cotton at the mills on March 1, 1910, as taken by the International Cotton Federation, is compared in the following table with the statistics for the preceding years:

STOCKS AT FOREIGN MILLS.

Date.	Spindle.	Bales on hand.	Bales used per week.	Stocks will last
Aug. 31, '05	46,726,929	935,237	103,269	9 weeks
Mar. 1, '06	54,297,537	1,237,180		
Aug. 31, '06	66,072,303	1,210,610	145,603	8.3 weeks
Mar. 1, '07	71,054,503	1,911,071		
Aug. 31, '07	74,279,078	2,368,410	190,811	12.4 weeks
Mar. 1, '08	78,984,106	2,342,127		
Aug. 31, '08	83,371,883	2,132,045	215,472	9.9 weeks
Mar. 1, '09	85,906,697	2,425,127		
Aug. 31, '09	88,188,004	2,275,392	222,740	10.2 weeks
Mar. 1, '10	91,154,411	2,492,688		

STOCKS AT AMERICAN MILLS.

Date.	Total Spindle.	Bales on hand.	Bales used per week.	Stocks will last
Aug. 31, '05	23,687,495	776,801	82,288	9.4 weeks
Aug. 31, '06	25,250,096	688,312	94,413	7.3 weeks
Aug. 31, '07	26,242,000	996,000	95,904	10 4 weeks
Mar. 1, '08 est.	27,000,000	1,089,119		
Aug. 31, '08	27,846,000	596,000	87,981	6.4 weeks
Mar. 1, '09	27,846,000	1,831,800		
Aug. 31, '09	27,783,000	908,000	97,788	9.3 weeks
Mar. 1, '10	28,000,000	1,674,000		

The census for March 1, 1910, includes 119,154,411 spindles out of a total of 133,421,004 for the world, showing that the Federation reports are now obtained from 89 per cent. of the spindles in all countries. In view of the short time on which the mills are now running it will cause some surprise to learn that the invisible supply this year is practically the same as on March 1, 1909.

The Cost of Living.

Marcus M. Marks, president of the National Association of Clothiers, is quoted as having stated in a recent address before the Academy of Political Science at Columbia University that "the farmer is the one who really has forced up the cost of living." The interests of every industry demand that the causes for the high cost of living should be determined and that remedies should be applied without unnecessary delay. Business in all lines is suffering as a result of the increase in retail prices, as well as from the popular fear caused by the discussion of high prices. It is not only important that the real cause for high prices should be determined; it is equally important that the public should not be misled into placing the responsibility for high prices where it does not belong.

It is natural that the householder who is called upon to pay high and continually advancing prices for farm produce should jump to the conclusion that the farmer who raised the produce was getting excessive profits. Until recently we shared that belief, but a somewhat hurried glimpse at some of the facts on two farms twenty miles from Boston has led us to believe that the

farmer is not wholly responsible for high prices for farm produce, and that in reality he is suffering in common with the consumer from a system of distribution that oppresses both.

Early last month we received a letter from the Massachusetts Commission on the High Cost of Living, couched in the language of an invitation, but containing the additional statement that the Commission possessed the power to compel the attendance of witnesses, if necessary. With the desire to help the Commission we visited a farmer friend living twenty miles from Boston, and spent the evening with him and a neighboring farmer listening to their statement of prices obtained by them for the produce of their farms, and which are given in the following list:

Corn. July not over 75 cents to $1.00 a bushel; August and September 25 to 50 cents a bushel; 5 dozen ears in a bushel.

Strawberries. Last year, 3 to 12 1/2 cents a basket; bulk 4 to 6 cents a basket.

Apples. Windfall, 30 to 60 cents a bushel; average, 40 to 50 cents a bushel; Baldwins, 75 cents a bushel.

Cabbage. Last year, 3 cents a head; 2 to 6 cents a head; Average 12 pounds. Get no more for a large than for a small head.

Tomatoes. Twenty-five cents to $2.50 a bushel (65 pounds to bushel); average, 70 cents.

Asparagus. Early May $7.00 a bushel or box of 3 dozen bunches; later $4.00 to $5.00.

Cauliflower. Last year, 25 to 50 cents a bushel; run 8 to 32 heads in a long box (2 bushel), 50 cents to $1.00; 4 to 16 heads in a small box (1 bushel), 25 to 50 cents.

Potatoes. Present prices 60 cents a bushel; last fall, 50 to 70 cents; average, 60 cents.

No ultimate consumer in Boston having a knowledge of what this class of produce costs at the house where it is consumed will accept without qualification Mr. Marks' statement that "the farmer is the one who really has forced up the cost of living." The great advance paid by the consumer over these farm prices proves conclusively that it is the cost of distribution that is responsible for the high prices of farm produce. It turned out that the Cost of Living Commission wanted to question us regarding the wool tariff, but we submitted to them these prices paid for produce on farms near Boston, leaving them the task of comparing the prices with those paid by Boston consumers, and of recommending suitable remedies.

"All Wool" Clothing.

It is to be regretted that a firm with a deservedly high reputation should allow its "ad" writer to place before the public such statements as the following, which recently appeared in an advertisement in the Saturday Evening Post:

"If a retail clothier shows to you a ——— smart suit or overcoat with a ——— label in it, he shows to you clothes that are made of all-wool, tested for purity. We, as makers of ——— smart clothes, stand behind this guarantee with the full strength of our reputation in two hemispheres, and with our 55 years of Knowing How. The ——— label is the mark of pure wool clothes."

The meaning conveyed by that advertisement is that the company has a way of testing the cloth they use, to determine whether it contains any material other than "pure" wool, that is, wool from the sheep's back which has not been used before in the manufacture of clothing. Of course they have no such method of testing at their disposal. Any chemical test that may be used, such as boiling in a solution of caustic alkali, dissolves "pure" wool, and other animal materials, such as shoddy, noils, wool waste and silk waste, in exactly the same way, and does not affect the vegetable material at all. Accordingly that kind of a test serves only to distinguish vegetable from animal material. "Pure" wool fabrics are entirely dissolved by it; so are fabrics made of wool shoddy, silk waste, noils or wool waste.

We asked the company for an explanation and were informed that they relied on the chemical test, but they added that "another way would be an examination by a practical man who would estimate how much virgin wool entered into the composition of the fabric." Here also is another error. The more "practical" a man is the better he knows that he cannot distinguish "virgin" wool from other wool materials when they are manufactured into cloth.

We believe the company will not again

allow its "ad" writer to fall into the error to which we have called attention. We wish we could believe that no other clothier will make this mistake, which is calculated to mislead the public and encourage an agitation such as that connected with the Grosvenor shoddy bill of 1902.

WOOL AND THE HIGH COST OF LIVING.

On April 8 the Massachusetts Commission on the High Cost of Living called three witnesses, William Whitman, Morrill A. Smith and Samuel S. Dale, who made statements in regard to wool goods. Mr. Dale made his statement first:

THE WOOL STORY.

Mr. Luce—Will you tell us the story of the wool schedule? We want to get at the cost of living with special reference to the bearing of the tariff. Of course, clothing is made of wool, and the story of the wool schedule is of importance for us to thoroughly understand. We call on you, knowing that you are thoroughly familiar with it.

Mr. Dale—It will save your time and facilitate matters if you will accept my statement to Senator Dolliver in April, 1909, for the general story. That story is concise and comprehensive, because I made the statement carefully and had an opportunity of revising the report of it.

Mr. Luce—We can read the story over, but would like to ask questions that might suggest themselves from your testimony.

Mr. Dale—Well, I will give the story in a few words. The inequality in the wool tariff is caused by the widely varying shrinkage in the scouring of grease wool on which a uniform specific duty is imposed. The scoured weight is the only thing that counts in making cloth. If one man imports wool that shrinks 80 per cent., paying 11 cents a pound duty on the grease weight, and another imports wool shrinking 20 per cent., paying the same duty on the grease weight, the two men have wool at widely varying tariff costs: 55 cents a scoured pound in the first case, and 14 cents a scoured pound in the second case.

THE UNDERLYING DEFECT.

That is the underlying defect, the thing that causes most of the complaints. It happens that the bulk of the wool which shrinks most in scouring is the wool best suited for the manufacture of medium and low grade, but durable wool goods, whereas the bulk of the wool that shrinks the least is suited for the more expensive goods. There are no reliable statistics of the wool clip of this country, and no one knows positively whether the clip is increasing or decreasing.

The general opinion is that the clip is stationary or decreasing. The country, as we all know, is developing and the population increasing so that the manufacturers of the medium and low priced goods are forced against their will to adulterate their fabrics in order to get the required yardage. Perhaps what I have said will afford a basis for some questions.

THE CARDED WOOLEN CONTROVERSY.

Mr. Luce—Tell us where the carded woolen controversy comes in.

Mr. Dale—The controversy between the carded woolen and worsted manufacturers arises from the fact that the more expensive goods are worsteds, made chiefly of light shrinking wool, while the carded woolen mills supply the medium and low priced goods, which require heavy shrinking wool. The carded woolen manufacturers protest against this specific duty and claim, I think rightly, that they are deprived of access to the great bulk of that part of the world's wool clip suited to their requirements. Only a very small quantity of the wool imported is manufactured into goods by the carded woolen process.

Mr. Luce—If we had access to the wool on the same basis as we have access to cotton, are you of the opinion that there would be no greater discrepancy in the price of wool than there is in the price of cotton goods?

Mr. Dale—To answer that statement it would be necessary for me to enter into the field of prophecy, which is a source of error as fruitful as it is unnecessary, and I would prefer not to make a statement about it. One man's opinion is as good as another's.

Mr. Luce—Has the worsted business been exceptionally profitable in the last few years?

Mr. Dale—You have the same evidence that I have as to that. It is only those who have access to the books who can tell you. You can judge by the developments of the industry; I cannot make a statement as to the comparative profits.

WHY?

Mr. Abrahams—What is class 2 wool used for?

Mr. Dale—For worsteds, braids and luster goods; a small percentage of it may be suited for carded woolen goods.

Mr. Abrahams—Why do they allow the other wool which has been washed on the sheep's back to be brought in at a single duty, as is the case of class 2 wool?

Mr. Dale—Echo answers "why?" That raises the whole question of how tariffs are framed. The single duty on washed wool of class 2 was granted in 1867 as a special privilege to worsted manufacturing, which was then an infant industry.

TWO METHODS OF COMPARISON.

Mr. Luce—Will you kindly put yourself in our position and state what you consider to be the effect of the wool tariff and the remedy for the inequalities in that tariff, the remedy as applied to the cost of living.

Mr. Dale—If I were in your position, I would conclude that the Commonwealth of Massachusetts had asked of me the impossible. I understand that it is the intention of this committee to

make a report in a comparatively few weeks. In the wool industry alone you have a problem that it would be difficult to investigate thoroughly in two years. For making your inquiries I would suggest that you select standard wool materials and get first hand information as to the prices at which they are sold in the United States and in England.

You can make comparisons in two ways: First, by comparing prices at which the same grades are sold, and secondly, by comparing the grades that are sold at the same price. Both methods of comparison are equally valuable, although the results of one can be more easily stated. For example, here are two fabrics, one made and sold in this country, and the other made and sold in England. The English fabric is sold at 3s 6d (84 cents) a yard, 55 inches wide. The American cloth is sold for 77 1/2 cents per yard, 55 inches wide, so that the two are sold at approximately the same price. The difference is represented by the difference in the two fabrics. The English cloth is a fine worsted, weighing 10 1/4 ounces per yard, 55 inches wide; the American fabric is made with a cotton warp and a mixed cotton and wool filling. The cloth consists of 30 per cent. wool and 70 per cent. cotton. It weighs 9.6 ounces per yard, 55 inches wide.

Mr. McSweeney—Do these samples tell the story of the wool situation?

Mr. Dale—They are cloths now being sold in the United States and England, and represent actual business conditions in the respective countries.

Mr. McSweeney—If this piece of American goods was made into a suit, would it be sold as an all wool suit?

Mr. Dale—That I cannot say. Many clothing salesmen do not know what kind of goods they are selling.

WHY THE WOOL CLIP IS DECREASING.

Mr. McSweeney—Will you tell the commission the cause of the decrease in the American wool clip?

Mr. Dale—The general opinion is that the clip is either stationary or decreasing. As to the causes, I will refer you to an incident that recently came to my knowledge. A press despatch had stated that the Baldwin Sheep and Land Company, Hay Creek, Oregon, owning about 27,000 sheep, had decided to go out of business. I wrote to this company, asking them to state the reason for their abandoning the business. They replied that it was due to the restrictions placed on the use of the forest reserves by the Government.

THE COST OF PRODUCTION.

Mr. McSweeney—Is there any way by which you have been able to work out the cost per unit of production.

Mr. Dale—It is impossible to get that information for the entire industry. Cost varies widely, not only between different countries, but also between different mills in the same country. It varies from day to day in the same mill on the same class of goods. The best a manufacturer can do is to get a system of bookkeeping that will show him what his cost has been for any particular period. Information as to the cost is the last thing that a manufacturer will ever give you, and he is the only one who possesses it.

FREE WOOL AND FREE GOODS.

Mr. Abrahams—What do you think would be the effect if the duty on manufactured goods was removed?

Mr. Dale—It would throw the industry into bankruptcy.

Mr. McSweeney—What would be the effect of removing the duty on wool?

Mr. Dale—That was tried once, and light can be thrown on your question by studying the history of the woolen and worsted industry from 1894 to 1897.

Mr. McSweeney—What was the effect?

Mr. Dale—It gave the wool dealers of America access to the world's clip, which was unquestionably an advantage to the manufacturer, but an injustice to the wool grower.

Mr. McSweeney—On what grounds was the tariff put on?

Mr. Dale—It was restored in order to protect the wool grower.

Mr. McSweeney—Access to the world's clip by the American manufacturer resulted beneficially to them, and then to protect the wool grower the tariff was put on?

Mr. Dale—The policy of protection is based on the principle of protection to all industries for which the resources of the country are adapted. If you deprive one branch of industry of protection it may result beneficially to some other branch, but it will, nevertheless, work an injustice. For a great many years I looked upon the Wilson bill as the bete noir of the woolen industry, but as I grow older it becomes more and more difficult for me to place the responsibility for a panic in 1893 on a tariff law that went into effect in 1894.

Mr. Abrahams—Can you give us any idea of the number of people employed in the woolen and worsted industries?

Mr. Dale—The census of 1905 indicated 72,000 in the carded woolen industry and 69,000 in the worsted industry.

THE EFFECT OF TARIFF REDUCTION.

Mr. Abrahams—If a reduction in the tariff on manufactured goods was made, would it not affect these employes?

Mr. Dale—It depends on what kind of a reduction it was.

Mr. Abrahams—What effect would it have on business?

Mr. Dale—Again it would depend on what kind of a reduction was made.

Mr. Luce—Do you ascribe any of the increase in the cost of wool goods in this country within the last ten years to the tariff, either directly or indirectly?

Mr. Dale—An increase in the cost of wool goods cannot be ascribed to any change in the tariff on wool and wool goods, because no change has taken place in that time. An increase in the price of wool has occurred the world over. The situation in this country has been aggravated by reason

of tariff rates which prevented us from drawing on foreign stocks of low priced materials, such as wool, wool waste, noils, rags, etc. There is no doubt in my mind that the unequal and excessive tariff rates on wool and wool by-products have deprived the American people of an adequate supply of wool clothing at a reasonable price.

Mr. Luce—I thank you, Mr. Dale, for your testimony.

Morrill A. Smith, treasurer of the Aetna Mills, Watertown, Mass., followed Mr. Dale on the stand and was asked by the chairman whether there was anything Mr. Dale had said that he disagreed with. He replied, "No, that there was nothing." He added that the labor cost was higher than it was 10 years ago, and also stated that the tariff has had no effect on the price of wool because it had not been changed in the last ten years. He was followed by William Whitman.

THE COTTON AND WOOL TARIFF.

Mr. Whitman—I have been asked to come before this committee, but I would have preferred not to come. Not, however, because of any unwillingness to meet you gentlemen of the committee, but because of the many engagements I have to take up my time. This pressure of time has prevented me from putting into form what I might be able to say to the committee had I ample time. I am going to confine what I do say almost exclusively to wools and cottons.

The existing tariff on wool and manufactures of wool, and on cotton manufactures, has been in operation but a short time. The making of that tariff occupied the attention of Congress for a long time. The investigations were more exhaustive than any tariff investigations within my memory, and I think that the discussions in Congress before the tariff bill was enacted were also the most exhaustive of any I have ever known, and I have had to do with tariff legislation for quite a number of years. In fact it has been the bane of my life.

I suppose you are well acquainted with the fact that the textile industry at present is in a very unhappy condition. I may say that I have never known so great a change in the cotton and woolen industry as has taken place in the last eight months. I shall not attempt to enumerate or discuss the causes of this general stoppage of business; but there can be no question but what this tremendous agitation over the alleged high cost of living is one of the chief factors. When the press of the country advertise to the entire country that the cost of living is excessively high, it would be strange indeed if the people did not withold purchasing. The world is filled with timid people, sometimes they are called cautious, perhaps timid is the better word to use, and they are influenced by this crusade on the part of the newspaper press.

THE COST OF LIVING.

I am not going into the question as to whether the cost of living is higher than it ought to be or not. I am afraid there are some things that we cannot learn with precision by an investigation. There are certain things, however, that I do know, and these things I am perfectly willing to tell you, and I shall be glad if they prove of any service to you, but I am rather afraid that they may not.

It is said that the cost of wool at the present time is excessive. The price of wool today is practically the same as it was on the 23d of October, 1907, when the financial panic struck up. That was not an industrial panic; we were not suffering at that time from overproduction. On the contrary the industrial conditions were exceptionally good. Had they not been, the panic would have been far more disastrous than it was. When that financial panic struck us, the industrial conditions of the country were in splendid shape to meet the reverses that afterwards followed. I have been looking over the prices of wool at that period. It took some time after that financial panic began before it affected the industrial and mechanical community. It did affect it, however, and prices of wool fell from those existing on Oct. 23, 1907, in the neighborhood of 25 per cent. I cannot state these things with accuracy, but on the 8th of May, 1908, we could have purchased for 62 cents wool that cost 84 1/2 cents in May of the previous year. There was a general suspension of operations in the woolen business at that time.

THE PRICE OF WOOL.

The farmers of the country could not sell their wool at the time it was sheared in 1908 at any price. Much of it was consigned to the seaboard for sale on commission, and the returns to the farmer were so utterly inadaquate that it aroused indignation, especially towards the merchants, who were able to buy in 1908 wool at such exceptionally low prices, exceptional because they were far below the intrinsic value of the wool as compared with the cost of foreign wools imported duty paid. These very low prices stimulated the purchase of wool goods. The moment the prices became established, a very large volume of business was done. During that year, I think it was a presidential year—and ordinarily in a presidential year merchants are usually careful—but notwithstanding that it was presidential year, and notwithstanding the fact that the tariff was to be revised, the woolen business was active, very active. Prices gradually advanced. Those who owned large stocks of wool, bought at exceptionally low prices, made much money. Of course, those who had not bought and sold their goods based on the high cost of wool, lost, but the industry as a whole prospered. I may say that it is impressive that, although there was a decline in wool in this country, there was also a decline in foreign countries, but not to anything like the same extent. I gave you 62 cents as the price of wool on May 8, 1908, and on Oct. 8, 1909, that same wool had advanced to 95 cents, or more than 30 per cent. The price has fallen, however, until today the wool is

the same price as on May 6 and Oct. 23, nearly three years ago.

The price of wool has not been affected by the tariff, because there had been no change in the tariff laws, nor any material change in the duties imposed on manufactured goods, so that this country has been going on under the same tariff known as the Dingley bill, which I think they put in operation in 1897.

THE SHRINKAGE OF WOOL.

All these matters with regard to the different kinds of wool and the different shrinkages of wool and the different uses to which wools have been put, have all be thrashed out and in a far more authoritative form than it would be possible for me to give you orally. If you think that you would have time to study the presentation of the wool manufacturers' case to Congress, which is printed in the Bulletin of the National Association of Wool Manufacturers, I would be glad to send each of you gentlemen a copy.

Wool is subject to great fluctuations in value. I do not know how many of you gentlemen have lived on a farm or know about sheep raising, but, with the growth of sheep there are a great many things that come to bear upon the development of sheep. In our own country, the sheep suffer from cold and exposure, and the changed conditions in transportation have had a great influence on the growth of sheep. I have said this much in regard to the wool and woolen tariff, and will say further that there has been no change whatever in what is known as the Dingley law, that was in operation for so many years. The price of wool has not been affected by the present tariff, nor has the price of goods been affected. I will forbear going into the broad question as to the effect of the protective tariff on prices, because no man familiar with the industry of this country can help admitting that its general effect has been to lower the prices for all commodities used by the American people, as compared with the rest of the world.

THE PRICE OF COTTON.

There were more changes made in the cotton schedule than in the woolen schedule. There were no great changes that would affect prices either upward or downward, materially. But let's look at the price of cotton. Cotton is free, and we can import it from Egypt, India, or anywhere. This brings to my mind a most interesting story: In September, 1903, spot cotton was quoted at 12 1/2 cents; it then declined, until on the 12th of October it reached 9.60, declining more than 20 per cent. From that point it rose steadily until on Feb. 1, 1904, it reached 17.25, an advance of over 80 per cent. The market then gradually declined until it reached 7 cents, on Dec. 28, 1904. From that point it continued to rise until on July 5, 1905, it suddenly jumped to 11.10, and on Aug. 23, 1905, to 11.25. It then continued to rise until on Dec. 7, 1905, it was 12.60. The market then steadily declined until it reached 10.30 on Aug. 30, 1906. It dropped to 9.80, and then rose to 13.55, on Aug. 30, 1907. The market fell off slightly until it reached 9.90 on April 19, 1908, and on June 21, 1908, it rose to 12.20 and on Sept. 30, 1909, it fell to 12.40, and then rose to its highest point on Dec. 30, 1909.

I can look back on the time when we could buy cotton for 6 cents a pound. No man can fix a normal price for raw cotton. Even at the present time, it is the cheapest fiber, most useful fiber known in the world, and the most extensively used of any fiber. It does not belong to any country or any climate. Its uses are constantly increasing. These various uses to which cotton is being put create the demand, and it is a very serious proposition as to how we are going to secure the supply to meet the demand. The price of raw cotton today is high. We cannot sell goods at a profit at today's price of cotton. There is a great curtailment in the manufacture of the cloth. I do not believe there is cotton enough to run the mills. It is nearly two and one-half times as high today as I have known it to be. People will have to change their views as to the value of cotton.

The cultivation of cotton is done mainly by negro labor, very largely on small plantations. The South is going to grow something besides cotton and tobacco, and its rich soil will compete successfully with the soil in any other part of the country. It would not be possible for me to give you statistical information in regard to the relative prices of products; but I would like to ask the members of this committee, before they decide the prices of textiles are too high, to glance over last Sunday's Herald, and see how cheaply and at what tremendous bargains the great retail stores of Boston are offering cotton goods to the trade. It cannot be possible that prices are high at these reduced prices.

ABOUT LABOR.

I think I have dwelt sufficiently long on the raw material. I will now turn and say a few words to you about labor. In speaking of labor, I have no authority to speak for anybody; I will speak for myself. I am in favor of labor unions, and I am in favor of labor laws, and I am in favor of proper sanitary regulations. I want the people in the industry in which I am engaged to receive liberal compensation for their labor. I will put it on purely selfish grounds. No great industry in this country can prosper permanently unless it has an army of workers receiving compensation commensurable with the compensation received in other industries, and for that reason I have always favored the payment of such wages in the woolen industry and in the cotton industry as will make the employment attractive to working people. In the formation of these labor unions there have undoubtedly been many errors made in their conduct, and there may have been abuses, but these abuses will be remedied in time, and I had rather deal with the representatives of a body than with individuals. I would be glad to have the labor in the mills of which I have the management paid as high, to say the least, as the wages paid anywhere else in the country under the same conditions.

In early times, the employer had the idea that the employee was a servant and that he had the right to fix the hours of labor, the compensation for labor, and, in fact, all the rights there were to it. Now, I do not believe in that. I could not carry on my business if I did not have the army that cooperates with me, and I cannot get that cooperation without recognizing their rights.

One of the reasons why I am so strong a protectionist is that I may be able to pay to the people employed by the concerns under my management, rates of wages that will give them employment and enable me at the same times to compete against the same kind of labor in foreign countries whose product can be brought here.

THE PROTECTED INDUSTRIES.

We hear a great deal about the so-called protected industries. The textile industries are only partially protected. We can bring here a corresponding product from another country in the textile industry, but you cannot bring here the buildings created by the builders. The protected industries are only those that can be carried on elsewhere. I have been a laborer myself, at least, I think I have. It has been a good many years since I labored with by hands. I admit I never did much of that.

I have been connected with the Arlington Mills since 1867, 43 years ago. I think the hours of labor were 60 a week. I do not remember when those hours were changed, and I am not going to give any comparisons back of 1880, for the simple reason that we were not on a gold basis before that time. This is not a complete list, it is only a partial one. In 1880 the hours of labor were 60 a week and today they are 56. Of course we cannot manufacture as cheaply running 56 hours per week as we can running 60 hours per week. The whole labor question forms part of the cost of my goods. The cost of the plant is increased more or less by the cost of labor, the cost of supplies, the expense of management and a great many other things. I have gone into that quite extensively in my statement before the Ways and Means Committee last December, which I can swear to, as in in fact I can to what I am testifying to now.

THE COST OF DISTRIBUTION.

The cost of distribution is a great contributing factor in the high cost of living. Do you realize that in the textile industries the profit on the manufactured article to the manufacturer would be from 5 to 10 per cent.? I would be pleased if I could run the mills I am interested in and secure a profit of 10 per cent. on the output. We take the cost of the textile material, and we say that the cost would be from 5 to 10 per cent. It costs as much to get the ordinary articles of the wool manufacturer into the hands of the consumer as it does to make the goods at the mill. In the Bulletin, to which I have referred, you will find evidence to this effect. The costs of distribution have increased more rapidly than any other costs. The entire costs and the profits added thereto of the newspapers and magazines of the United States, including the alleged excessive cost of mailing magazines, is a cost added to the cost of distribution. It may be a necessity, I am not complaining of the newspapers or of the magazines, but I believe it to be absolutely true that the entire cost of publishing and distributing the newspapers of the United States and the magazines is one of the great contributory causes to the cost of merchandise, and this is borne by the consumer. I hope that some day some authorized body will make an investigation along this line.

Mr. McSweeney—That is what this committee is trying to do.

Mr. Whitman—In how long a time.

Mr. McSweeney—We have until the first of May.

Mr. Whitman—I wish you had five years. There is another point which I wish to mention. Probably the alleged high cost of many articles is owing to the disparity between the number of people engaged in producing and the number of people who are not engaged in producing. As an economic question, I have not the slightest faith in these people who think there is a war between capital and labor. The actual condition is the adjustment of the labor in the different industries, and I do not know of any way to solve that problem except by the bitter experience brought about by the rise and fall of values. You have seen in the newspaper lately how well it would be for the people to take up the abandoned farms in New England for the raising of sheep, but so long as you can give people more profitable employment, or pleasanter employment, or a pleasanter social life elsewhere, you cannot get them to go back to the farms. So I really believe that the fundamental reason of high prices is the disparity in the numbers engaged in the producing and the non-producing industries.

ARE PRICES REALLY HIGH?

Mr. McSweeney—In your statement, you say that the newspapers carried on the agitation for high prices, and called attention to the Boston Herald of last Sunday. You state "alleged high prices." Do you mean to insinuate that the prices paid by the consumer are not high, and that it is not actual, but mere assumption?

Mr. Whitman—I am in doubt about that.

Mr. McSweeney—Regarding newspaper advertisements. Do you mean to say that a personal canvass would be more profitable than advertising?

Mr. Whitman—I am not able to give you any figures.

Mr. McSweeney—Did you state that a great amount of discussion had been entered into in regard to schedule K, or did you refer to the entire bill?

Mr. Whitman—Schedule K.

SENATOR SMOOT IN CHARGE.

Mr. McSweeney—Who had charge of the framing of schedule K? Wasn't it Senator Smoot?

Mr. Whitman—I don't know who had charge of it.

Mr. McSweeney — Senator Smoot represented the western wool growers, and did he not have entire charge of the revision of schedule K?

Mr. Whitman—I do not know. I never met Senator Smoot

Mr. McSweeney—What is the proportion of native grown wool?

Mr. Whitman—That varies, but about two-thirds of the wool is grown here.

Mr. McSweeney—Can you send us the figures substantiating those figures?

Mr. Whitman—I would be very glad to.

Mr. McSweeney—Cotton has always been imported free?

Mr. Whitman—It has.

Mr. McSweeney—There has been a failure to increase the production of wool, which, according to statistics, has fallen off during the last 38 years. How do you account for that?

Mr. Whitman—There are several reasons, chief of which is the high price of mutton. The kinds of wool are changing in the different countries of the world, owing to the increased use of mutton for food, and I suppose there will come a time when the price of spring lamb will be so high that the farmer will be induced to sell the sheep rather than keep them for wool growing.

Mr. McSweeney—Would it be asking too much of you to tell how much American wool was used, say for the last 30 years?

Mr. Whitman—The wool clip is, as near as we can tell, about 330,000,000 to 350,000,000 pounds.

THE COST OF PRODUCTION.

Mr. McSweeney—Can you tell the unit cost of a yard of wool goods, the unit labor cost of any specific grade of wool? I want to get at what it costs to manufacture in this country and abroad.

Mr. Whitman—That is absolutely impossible.

Mr. McSweeney—Why?

Mr. Whitman—It has been tried.

Mr. McSweeney—We can get the units of cost and find out what the labor cost is in all other industries, say boots and shoes, for instance; why cannot we get it for wool?

Mr. Whitman—It cannot be done. There are a great many problems that cannot be solved and which have been left unsolved. It may be that the men engaged in the boot and shoe industry are more capable than in other industries. It may be that they are able to state facts or alleged facts. As for example, the testimony given in a tariff discussion in regard to the duty on hides, which was so grossly exaggerated.

Mr. Luce—Would it be possible for you to state whether, in your judgment, the labor cost of producing woolen good has increased?

Mr. Whitman—Yes. The labor cost in manufacturing wool goods, I think, has increased; the price of labor has increased very materially. Labor is no more efficient than it was 40 years ago.

WOOLEN GOODS NO HIGHER HERE.

Mr. Luce—We must look, of course, to the raw material as the chief cause of the increase in the price of any product. Why is it that we find such a discrepancy between the price of woolen goods in this country and other countries? What is your explanation of the difference?

Mr. Whitman—Your question is, why, if it be true, are the prices of woolen goods higher here than in other countries? I do not believe that woolen goods are any higher here than abroad. I tell you, as a matter of fact, that excepting some very coarse fabrics, cotton goods are cheaper in Great Britain than they are here. That is the reason why they are able to control the cotton goods market of the world.

Mr. McSweeney—How does the American workman compare with the foreign workman?

Mr. Whitman—The American workman is no more efficient than the foreign workman.

TWO SAMPLES.

Mr. McSweeney—We have here two samples of goods, one of English manufacture and made of pure wool, selling at 84 cents; the other a piece of American goods selling at 77 1/2 cents. That, in a word, represents the price of wool goods and the conditions of manufacture in this country and in Great Britain. What have you to say?

Mr. Whitman—I have nothing to say about it. It is a waste of time to put such questions. I would have to go through a system of analysis and be sure of the facts.

Mr. McSweeney—Won't you take the samples and analyze them?

Mr. Whitman—I have not time to do it. I don't know anything about them, and I don't believe the man who gave them to you knows anything about them.

THE EFFECT OF SCHEDULE K.

Mr. McSweeney—What explanation have you as to the effect of schedule K on the American people?

Mr. Whitman—I was asked the same question by a member of the Ways and Means Committee, who had received a letter from some man, complaining of the quality of American goods. I want to state to you most emphatically that one of the blessings of schedule K is that it is so constructed as to practically prohibit the importation of worthless shoddy material in the manufacture of which Great Britain beats the world.

Mr. McSweeney—You stated during your testimony that the woolen trade was not in a pleasant frame of mind. Do you know any shoddy manufacturer in this country that is not in a pleasant frame of mind because of his large profits?

Mr. Whitman—I do not know.

Mr. McSweeney—Mr. Luce and I have been in Canada and visited manufacturers of cloth and retail dealers in clothing, and they have shown us these cloths and have admitted that while our cloths were selling for as much as their cloths, ours were made of about 70 per cent. of wool with a cotton foundation.

Mr. Whitman—I cannot believe that is so.

Mr. McSweeney—These men are not interested in schedule K so why should they tell us a lie.

Mr. Whitman—I do not know that they know. I am a descendant of John Whitman who in 1635 came to Canada, where I was born. I left Canada or Nova Scotia when I was twelve years old, and became a citizen of this great and glorious Republic, because there was no chance there. Since that time they formed the Dominion of Canada and adopted the American system of protection, and Canada is now becoming a great and prosperous

country. I am getting to be an old man and have been in business ever since I can remember, and I am quite a student of statistics. If any of you gentlemen are lawyers you will admit that it is a rather difficult thing to secure a fact and I have to reject about ninety-nine hundredths of the stuff I get.

PRESIDENT TAFT AND THE WOOL TARIFF.

Mr. McSweeney—How do you explain President Taft's reference to schedule K?

Mr. Whitman—I think President Taft is a great man, but I do not know of any reason why he should know any more about the wool tariff than does the gentleman who recently refused to receive Mr. Roosevelt.

Mr. McSweeney—It has been stated by men high up in authority that schedule K has brought about a condition of affairs where the poor are unable to buy wool goods with which to protect themselves from the cold, and that it thereby greatly fosters the spread of tuberculosis.

Mr. Whitman—This reminds me of a lady friend of mine who has a habit of saying, "they say this" or "they say that". The American people are better clothed than any other people in the world, and their clothes are better made. The goods that are salable in England would not be salable here. There is less shoddy used here than in Great Britain in proportion. We manufacture more woolen cloth per capita than they do, and the people of this country are better clothed and fetter fed than the people of other countries. That is evident from the ship loads of people that come over to this country yearly to better their condition. The theory of tuberculosis is of recent origin.

Mr. McSweeney—It started in Philadelphia in 1775.

Mr. Whitman—It is absolutely false that cotton cloth is more liable to increase the disease called tuberculosis than woolen cloth. Shoddy is more absorbent than cotton. Shoddy is wool ground up and the amount of moisture under normal conditions in cotton is about 6 per cent., and in woolen cloth about 15 per cent. Shoddy is one of the most useful waste products we have.

Mr. Abrahams—I would like to ask Mr. Whitman a few questions. Has your method of manufacture changed since 1880?

Mr. Whitman—Only in the introduction of new machinery.

Mr. Abrahams—Has the volume of your product increased?

Mr. Whitman—Yes.

Mr. Abrahams—Could you give us the approximate labor cost of a suit of clothes?

Mr. Whitman—I could not.

Mr. Abrahams—Do you think the European laborer is equal to the American laborer?

Mr. Whitman—I do not think they are quite. The American workman is more industrious and sober than the workman in foreign countries.

Mr. Luce—That is all, Mr. Whitman.

The exports of raw cotton to Italy since 1880 increased from 59,126 bales to 565,695 bales in 1909.

SEASONABLE FABRICS.

DRESS GOODS.

The importers and domestic manufacturers have enjoyed one of the most prosperous spring dress goods seasons that they have ever had. Even with advances of about 10 per cent. over one year ago, the demands have been larger than the supply on all of

FIG. 1.

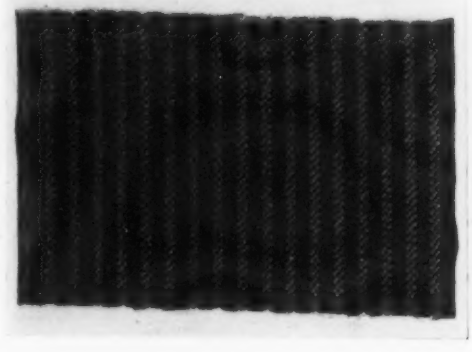


FIG. 2.

the more popular fabrics. Plain weaves such as storm serges, imperial serges, cashmeres, batiste, etc., have been the most favored fabrics.

The demands for 36-inch serge in navy, black and cream has been one of the features of the trade. These shades in popular priced serges continue to be in demand and from the present outlook they will hold a very strong position in the market during the entire summer season.

In fancy dress goods striped effects continue to be favored over checks and plaids. The trade are calling for the neat hair line effects such as Fig. 1, from King, Beals & Co., 54 inches wide, at 87 1/2 cents a yard. Fig. 2 shows a neat stripe from Franz Merz, 54 inches wide, at $1.20 a yard. Popular priced cream hair line stripe serges are in demand in qualities 36 inches wide, costing from 30 to 42 1/2 cents a yard.

FIG. 3.

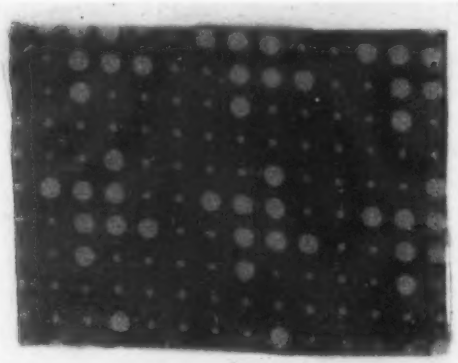


FIG. 4.

The importers and domestic selling agents catering to the advance trade report that they are booking some very large orders for fall deliveries. Broadcloths are holding a strong position for the coming season, with serges and panamas gaining in favor. Piece dyed fancies in diagonal weaves are finding a ready market in full color assortments.

SILKS.

Conditions in the silk market have shown but few changes during the past month, while the demands for spring silk fabrics has not been as active as in former years. The manufacturers feel confident that a steady trade will continue on the weaves that are finding a ready market during the spring and summer seasons.

The demands for foulards has been one of the features of the market. These goods continue to gain favor as the season advances, especially in qualities costing from 42 1/2 to 60 cents a yard, in the new spring shades of catawba, old rose, wisteria, reseda, tans, navies, etc. Fig. 3 shows a neat design at 42 1/2 cents a yard, 24 inches wide, from Samuel Eiseman & Co. Fig. 4 shows a 40-inch foulard from Arnold Constable & Co. at 85 cents a yard.

While the demand for rough pongees and shantung silks are not as large as in former seasons, the buying trade continue to call for these goods, especially in the natural pongee shade.

Plain colored taffetas as well as black are selling in small quantities where closing out prices are made. The demand for regular stocks of these taffetas has been very slow this season.

In the fancy silk market two toned changeable effects continue to be in demand. Pelgram & Meyer are offering a stripe effect at 60 cents a yard, 20 inches wide. Shepherd checks are gaining favor in all qualities. Givernaud Bros. have a very popular line, 19 inches wide, at 32 1/2 cents a yard.

Black moires in the new ribbon patterns are being shown by several manufacturers both for immediate and fall shipments.

Several manufacturers of silk and cotton mixed fabrics have stimulated trade on these goods by making reductions of about 10 per cent. during the last few weeks. The 27-inch plain silk and cotton fabrics are offered at 16 1/2 cents. A number of buyers who have visited the market during this month have secured these silk and cotton jacquard effects at 20 cents a yard. The opening spring price was 28 1/2 cents.

COTTONS.

During the past few weeks the cotton goods market has been in a very unsettled

condition, especially for staple goods, on which reductions of about 10 per cent. have been made on all lines of muslins and wide sheetings. The popular brands of 4/4 bleached muslins are offered as follows: Hills, 8 1/2 cents; Lonsdale, 8 3/4 cents; Fruit of the Loom, 8 3/4 etc. Several mill agents are offering a 68 by 72 count 36 in muslin at 6 3/4 cents. While these prices are considered low, compared with the present raw cotton market, the buying trade continue to operate very conservatively, and in most cases are only supplying their immediate wants. The manufacturers say that they cannot continue to offer lines at the present quotations unless reductions are made in raw cotton.

The demand for seasonable novelty wash fabrics continues to be very active. Repps, poplins and printed sheer fabrics are the most in favor. In fact these fabrics are gaining favor as the season progresses, and they will finish the season very strong. The demand for dress ginghams is not as active as earlier in the season. This is due to some extent to the increasing demands for plain fabrics.

The call for mercerized sateens and other cotton linings continues active, especially for the new spring shades. Prices on these linings were advanced earlier in the season, but recent reductions have placed them on a normal basis.

The mills catering to the advance fall trade report that they have booked some very large orders for flannels and fleeced goods for the coming season; in fact several of the popular brands of flannels are sold up, and will be available only through the jobbers. Advances of about 7 1/2 per cent. were made on all lines of flannels and flannelettes over last season.

Trade in the white goods market continues. The demand for sheer white goods has been one of the features of this market. Mercerized jacquards continue to be active, but have given away to some extent to plain weave fabrics. Cross bar lawns especially in the better qualities costing from 14 to 20 cents are gaining favor as the season advances.

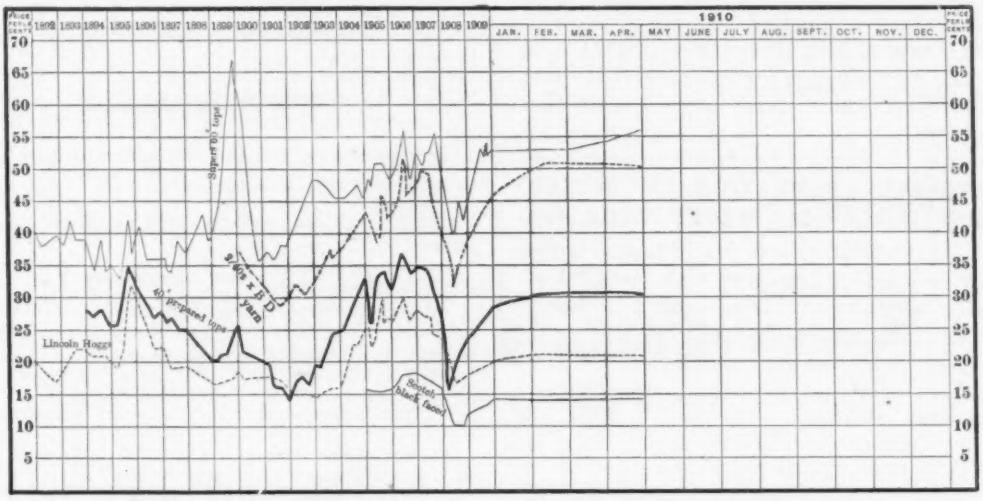


CHART SHOWING COURSE OF PRICES FOR WOOL, TOPS AND WORSTED YARN AT BRADFORD, ENGLAND.

THE BRADFORD MARKET.

In mid April the significant features are the strength of fine materials and the weakness of coarse ones. Low crossbreds are due to encounter a further fall in the next London series and users are holding off for advantages. Under the influence of new supplies the prices of home-grown wools have been marked down a trifle all around.

The industrial position is still very strong. Only a few worsted spinners are in any

degree short of orders. Although commission looms are easier to get, there is no necessity to have the machines standing for over a day or so at a time. This position does not arise from any large operations on the part of individual buyers who would be willing to see the pressure cool down. But there are no stocks of importance. Export orders for cloths continue to come in and books are well filled for some time ahead. The carded woolen mills have all that they can manage and are expecting in the fall to see good orders for dress tweeds.

Our position is in sharp contrast to the American one and wool dealers report not only an absence of American purchases, but an indisposition to take delivery of some wool already bought for American account. In round terms, English exports of woolen and worsted goods are 20 to 25 per cent. greater during the first quarter than in the same three months of last year. It is the world-revival that keeps this market busy.

The new charges for combing (see "English Notes," this issue) are to take effect from July 1.

NATIONAL ASSOCIATION OF HOSIERY AND UNDERWEAR MANUFACTURERS.

This Association is to hold its sixth annual convention in connection with the fifth annual exhibition in Philadelphia on May 23 to 27. The convention will be held at the Walton Hotel and the exhibition at the Horticultural Hall on Broad St., adjoining the Academy of Music. The hall is large and affords practically twice as much space as has been used in previous years.

The following is a partial list of the exhibitors who have contracted for space:

PARTIAL LIST OF EXHIBITORS.

Acme Knitting Machine & Needle Co. 3
Andreykovicz & Dunk 70
American Wool & Cotton Reporter 104
Ballard Electric Cutter x
Beck, Charles, Paper Co., Ltd. 83
Beckert Needle & Supply Co. 97
Berlin Aniline Works 72
Bond, Charles, Co. 8
Brinton, H., Co. 102
Cotton Publishing Co. 82
Dry Goods Economist 93
Ford, J. B., Co. 84
Grosser Knitting Machine Co. 95
Harding & Fancourt, Inc. 90
Hemphill Mfg. Co. 77
Jenckes Knitting Mach. Co. 100
Jenckes Spinning Co. 101
Hirsch, Louis 4
Kaumagraph Co. 86
Knit Goods 5
Lord & Nagle Co. 79
Maimin, H. 78
Lowell Machine Shop 52
Lever, Oswald ..... 10 & 11
Manufacturers' Supply Co. 7
Mayo, Geo. D., Machine Co. 95
Merrow Machine Co. 102
New Bedford Textile School 75
Nicetown Dye Works 96
Nonotuck Silk Co. 85
Philadelphia Drying Machinery Co. 88
Posselt Textile Journal 91
Rex Dyeing & Finishing Co. 92
Roessler & Hasslacher Chemical Co. 87
Scott & Williams 80
Smith, Drum & Co. 9
Southern Textile Machinery Co. 51
Standard Machine Co. 50
Textile Manufacturers' Journal 89
Textile World Record 79
United States Truck Co. 94
Universal Winding Co. ..... 73 & 74
Wilcomb Machine Co. 98
Wildman Mfg. Co. 99
Willcox & Gibbs Sewing Machine Co. 76
"Wholefoot" Hosiery Stamp Co. ..... 16 & 25

The program for the various sessions of the convention is as follows:

Morning Session, Tuesday, May 24, 1910. Open Session.

Address of Welcome by Hon. John W. Reyburn, Mayor of Philadelphia.

Annual Reports of the President, Secretary-Treasurer and Executive and Legislative Committees.

Address by Chas. H. Porter, of the New Bedford Textile School, New Bedford, Mass.

Afternoon Session, Tuesday, May 24. Executive Session.

Hosiery Manufacturers. 2.30 P. M. Meeting of the various Hosiery sub-associationss.

Underwear Manufacturers. 2.30 P. M. Convention Hall. Special Meeting of the underwear members. There will be a discussion upon the following topics: What would be a proper standard of sizes and lengths of shaped goods? Ways and means to secure the adoption of uniform color boxes, bands and labels. Ethical relationship as it should exist among competing manufacturers.

Morning Session, Wednesday, May 25. Only knitting manufacturers and associate members are invited. Meeting called to order at 10.30 A. M. at the Walton Hotel. Reports of Special Committees. Address on Strike Insurance by Fred T. Crichton. Address on Dyeing of Hosiery by a representative of the Berlin Aniline Works, New York. Discussion of Executive Committee's Report. Discussion of the following subjects: Ad-

vantages of Uniform Terms. Net Weight Yarns. Child Labor Laws. Credit Bureau Department. Is it to the best interests of manufacturers to market his production under his own or the jobber's special brands?

Afternoon Session, Wednesday, May 25.

Hosiery Manufacturers. 2.30 P. M. Meeting of the various hosiery sub-associations.

Underwear Manufacturers. 2.30 P. M. At Walton Hotel. Special meeting of the underwear members. Manufacturers, not members, may attend this session upon application to the secretary-treasurer.

Morning Session, Thursday, May 26. Only knitting manufacturers and associate members are invited. Admittance to the hall will be confined to those holding registration cards. Reports from Special Committees and chairman of sub-meetings. Resolutions. Election of officers. Appointment of committees. Selection of dates for next meeting. Adjournment.

Afternoon, May 26. Entertainment features.

Evening, May 26. A banquet will be given at the Walton Hotel.

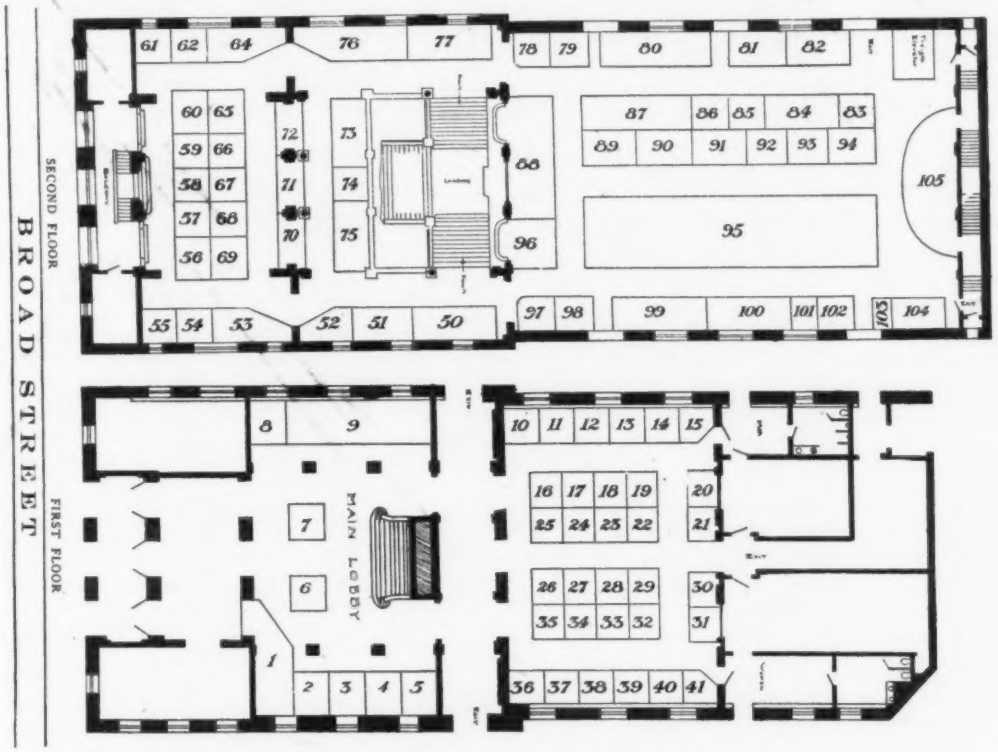


DIAGRAM OF HORTICULTURAL HALL, PHILADELPHIA, SHOWING ARRANGEMENT AND ALLOTMENT OF SPACE FOR THE EXHIBITION.

The exports of raw cotton to Canada amounted to 19,619 bales in 1880 and 131,453 bales in 1909.

NATIONAL ASSOCIATION OF WOOLEN AND WORSTED OVERSEERS.

The twenty-seventh semi-annual meeting of this association will be held at Field's Point, Providence, R. I., on Saturday, May 21, at 10 A. M. A banquet will be served at 1 P. M. These meetings have for years been a pleasant and profitable feature and a large attendance is expected this year. New officers will be named and other business of importance transacted.

Of the 8,895,970 bales of cotton exported from the United States in 1909, 3,665,355 bales went to the United Kingdom, 2,438,090 to Germany, and 1,098,173 to France.

The number of spindles increased from 1,940,000 in 1900 to about 5,000,000 in 1909, and the quantity of cotton consumed from 475,000 bales to 941,000 bales.

The National Association of Cotton Manufacturers.

Every session of the annual meeting of the National Association of Cotton Manufacturers held at Mechanics Building, Boston, on April 27 and 28, was marked by a large attendance. After the meeting was called to order on Wednesday morning, April 27, Secretary Woodbury read his report, which showed the association to be in a flourishing condition. Accessions during the year have brought the membership to 997, to which must now be added the number of new members admitted at this meeting.

The medal committee next made its report, awarding this year's medal to Secretary C. J. H. Woodbury for his compilation of the Bibliography of the Cotton Manufacture. Governor Eben S. Draper then delivered the following address of welcome:

ADDRESS OF WELCOME.

I was very much struck when your president started on his kindly introduction of me when he said that "one of the pleasantest features of these annual gatherings in the capital city of Massachusetts is the welcoming voice of its chief executive, which always makes us feel so much at ease." I was delighted with that particular sentence, because it recalled to my mind the fact that many of you gentlemen have heard that voice a great many times making a special plea in his own interest, but at the same time in the interest, of course, of the gentlemen to whom he was talking, and I am very glad indeed to have your president say that it is not disagreeable to hear it again as the welcoming voice of the chief magistrate of this great Commonwealth.

I assure you, gentlemen, that it gives me a great deal of pleasure to come here and welcome the cotton manufacturers to Massachusetts. There is no body of men that can meet in this great capital city that I feel so closely in touch with as I do with the cotton manufacturers of this state and this nation. My whole business life has been passed in the closest relation with them. I feel that I know something about the business, and it is a peculiar pleasure outside of a public duty, to welcome you to the Commonwealth of Massachusetts.

Whenever you come here, I undertake to say a few words about business questions which I do not do in welcoming bodies ordinarily to this Commonwealth. We hear a great deal of talk today about the question of high prices, and I do not propose to go into many details in that direction; but there are two or three reasons that you as business men, I know, comprehend perfectly, and I want to refer to them briefly.

I first want to mention the enormous production of gold. There has been more gold produced in the last ten years which has gone into use as money than in the preceding hundred years. The consequence is that as the production of wheat and oats and grain, etc., in proportion to consumption, has been reduced, and the production of gold has been enormously increased, it goes without saying that a bushel of wheat must cost more gold than it did formerly, because the gold has increased in proportion to what was the demand, while the production of wheat or other great product has decreased in proportion to the demand.

Another great reason for the increase of prices has been the rise in wages in all departments of life. Taking 1896 as a standard and coming on to the present time, I doubt not that the average increase of wages has been 30 per cent. at least. I am not making that as an absolute statement, but I believe it to be true, and I should not be surprised if it was more, and in many directions I know that it is much more. And while labor may be more efficient in any particular direction, that great increase in the price of wages must necessarily affect the price of whatever it produces.

But more important in my opinion than either of these as applying to the question of high prices is the old law which we always have with us and always will, gentlemen—the old law of supply and demand. You take the manufactured products of this country, and in spite of the increase in wages and the increase in the production of gold, you see that the increase in the price of those manufactured articles, while more than it was a few years ago, is comparatively little more; but when you come to the product of the farm—to horses, for instance—I bought one this morning and it nearly ruined me. Take the product of the farm and see how the price has increased in that last ten or twelve years—gone up in many instances 100 per cent. As I was talking to this man about the price of this ordinary horse which I bought this morning, I said, "Why, I have never seen anything like the prices for horses." He said, "Governor, the price of horses has gone up 100 per cent. in the last six or eight years." I said, "Why?" He said, "Because as the automobile came into use, farmers supposed that horses were going to go out of use altogether, and the consequence was that they stopped breeding, and today the ordinary horse costs 100 per cent. more than it did five years ago." That is an illustration of the power of the law of supply and demand.

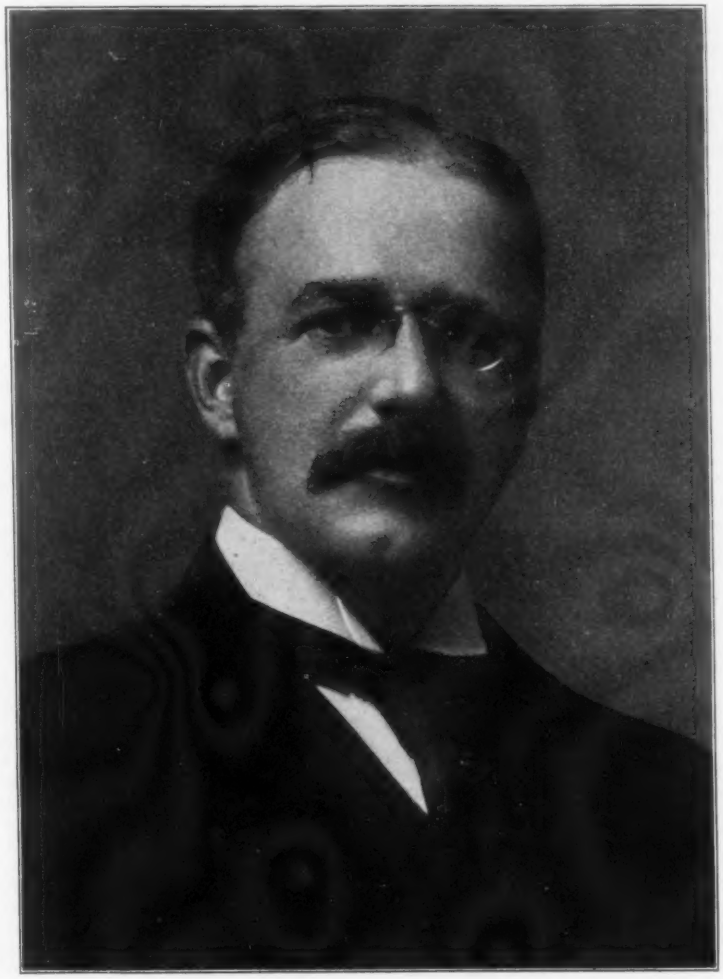
A few years ago we were exporting our production of grain in enormous quantities, and the price was fixed in the markets of the world abroad. Today you find that the export of these great cereals is very limited, and the people have

come to this country and are consuming them here, therefore the demand has increased enormously and the production has not kept pace with the increased demand, hence the increased price.

I think you gentlemen know something about the law of supply and demand this year. Last year you had 13,500,000 bales of cotton, and the price was 10 to 10 1/2 cents a pound. This year you have 10,500,000 bales of cotton and the price of the raw article is 15 cents a pound, not nearly as good and hard to get. If that is not an illustration of the law of supply and demand that you gentlemen can understand, I fail to know where there is one.

Now, I do not propose to talk about the tariff and trusts as they affect the price of articles, because if I did I might get into politics, and that I propose to avoid and not say a word in that direction. But I want to just make two illustrations in that line, to show that that cannot account for these things to the same extent as the general laws to which I have referred.

The high price of leather certainly cannot be laid to the tariff, because the duty was entirely taken off from it. The increase in price of food products, if there be any, cannot be laid to these matters, because the duties were reduced. Therefore it is not necessary to go into the discussion of the details of those questions to make a few plain statements of fact which business men of education and experience understand, even though some of the people unfortunately do not. But while I am here today I want to say a few words about the condition of the cotton manufacturing



FRANKLIN W. HOBBS, ELECTED PRESIDENT OF THE NATIONAL ASSOCIATION OF COTTON MANUFACTURERS.

industry. I rejoice in the courage of the cotton manufacturers, because if they had not courage they would not be building new mills today under existing conditions.

We find the raw staple selling at this tremendously high price of 15 cents a pound or more, the quality not as good as it has been in some years, the demand for the manufactured goods not good at present, hard to sell their products; and still we see in New Bedford the greatest expenditure for the construction of new mills that has taken place in any of our great textile cities in years, great additions being made and contemplated in Lowell and Lawrence, and other sections of New England. That shows that in spite of the temporary bad conditions which are existing the cotton manufacturers, who are not merely brave, but level-headed and wise, believe that the future of the cotton industry is secure, and that business is going to be good. And as each year when you come here I undertake to be something of a prophet, I will prophesy now that that opinion is correct and that that is what is going to happen and that business is going to be good in this great industry, and I am delighted to make that prognostication. It sounds well now, and I only hope it will prove true. (Applause.)

Now, gentlemen, I have talked to you a good deal longer than I had any intention of doing. I know you are not here to hear me make a speech. But I want to say to you that the Governor of Massachusetts appreciates the great textile industry in which you are engaged. It is one of the three great industries that this Commonwealth and her people depend upon, and I appreciate its importance. I believe that it should be properly fostered and cared for by the laws of the Commonwealth of Massachusetts. And while I am not the legislature, I do have some part in the making of laws in this state, and I think I realize the great importance of this industry to the Commonwealth. And it gives me great personal pleasure as Governor of Massachusetts to welcome you gentlemen to the capital city of this state, and I trust that your stay will be pleasant, that your meetings will be most gratifying to you personally and helpful to the industry, and that later on you may come here again to renew your acquaintance with Boston's citizens and with the hospitality of the capital city of the Commonwealth of Massachusetts. I thank you, gentlemen. (Applause.)

Franklin W. Hobbs responded to the Governor's address as follows:

I know that it is a pleasure to each one of us here to have today with us his Excellency Governor Draper. We thank you, sir, for your very cordial welcome to Massachusetts and appreciate, I am sure, the hopefulness and the courageous spirit of your remarks on the cotton industry. You have been so long associated with the industry and with this association that it is especially gratifying to us to have you here in your official capacity. Our president kindly remarked that I could be quite brief, and I know you are all waiting to hear his address, so that I will only say in closing that I hope—I should say I firmly believe—that the splendid services that Governor Draper has rendered to the Commonwealth will certainly be approved next fall by greater majorities than ever, and that next year we may again have the great pleasure of listening to his welcoming words and his welcome on behalf of the Commonwealth. (Applause.)

President Plunkett then delivered his annual address:

President's Address.

CHARLES T. PLUNKETT, Adams, Mass.

When we last met in this hall, on the occasion of the annual meeting of 1909, we bade adieu to the aftermarth of a disappearing panic; took an inventory of the salvage, and optimistically entered upon a year's business having as basis of favorable expectations the splendid cotton crop of 1908, unsurpassed at any time in quality and quantity, with a fair prospect of its duplication in 1909. Then, too, the tide of immigration had set strongly to our shores, capital was abundant in every portion of the country; labor was well employed and the market gave every promise of normal conditions.

Even though it might be truthfully said that the larger part of the year resulted in no serious disappointment in actual transactions, the outlook for more remote business became obscure when it appeared certain that there would be an undersized and somewhat inferior crop, with the ever-present manipulation which adds its disheartening handicap to a world-wide industry whenever for natural or other causes the crops are of controllable size. The foreign spinners acted promptly in meeting the inevitable results of abnormal cost by sweeping curtailments in their consumption of cotton, commencing in July and amounting to about 2,000,000 bales to this time.

Whatever the outcome to themselves, there can be little doubt of the effect on the cotton market on this side of the Atlantic, where curtailment has been spasmodic, desultory and ineffective. While measures for suppression of speculation and attempts to thwart organized efforts to control acreage may fail to meet the expectations of those who believe that the American fields should continue to supply the world with this staple, there will be no suspension of commercial and financial encouragements offered by foreign governments to already powerful industrial interests whose very existence depends upon a sufficiency of raw materials. The stimulation of national and colonial agriculture, commerce and manufactures projects its potent influence beyond these productive enterprises to bless the greater portion of the human family, dependent as it is upon nature's gifts, which are infrequently discovered as nuggets, but are developed through the energy and genius of moving forces and the employment of both skilled and unskilled labor.

For many centuries mechanical ingenuity has left its monuments wherever the crying needs and pressing demands of humanity have become known, and will continue to be recorded in the volumes of history as well abreast of the greatest humanitarian agencies. It may yet transpire that mathematically determined acreage, scientifically prescribed balancing of crops to spindle produc-

tion, shrewdly devised financing of available stocks, disconcerting quotations of fictitious sales and numberless other artificial barriers to natural law will be defeated by the tireless reinforcing army of inventive genius.

The progress of the race parallels the era of most revolutionary invention in labor saving and otherwise economy producing devices and has most markedly confirmed the proposition,—that the elimination of useless toil provides a new and superior form of labor, which furnishes in the most advanced countries of the earth the highest types of employment, without diminution of individual opportunities in any stratum of society. The field picker and the gin compress are notably in the front rank of recent developments of agricultural machinery as affecting textile manufactures and their employes. In event of demonstrated success of the picker, the contention that scarcity of labor will permanently prevent a considerable increase in planted area will have lost its force, and soils particularly adapted to raising cotton in varieties not now cultivated in this country may be tilled and the lint gathered by machinery where hand labor is wholly inadequate numerically. The United States Department of Agriculture, having a station in Arizona, has announced the result of a two years' experiment with Egyptian seed which satisfactorily proves to the Bureau of Plant Industry that the soil and climate are especially adaptable. Should there be substantial foundation for this report, the paucity of plantation hands will no longer be a deterrent factor to wide cultivation, and the extraordinary additions to fine yarn spinning machinery (made both here and in Europe, while staple cottons are, prospectively at least, growing scarcer) may be supplied at costs comporting with such economical manufacture of goods as will stimulate and not restrain the new uses of fine fabrics and permit freer consumption of those heretofore produced. The absorption of nearly 300,000 bales of longest and strongest stapled cottons for automobile tires illustrates how speedily a large percentage of a limited crop may at any time be diverted to novel purposes.

With a fortunate outcome of the gin compress, the first substantial progress will have been made

CHARLES T. PLUNKETT, THE RETIRING PRESIDENT OF THE NATIONAL ASSOCIATION OF COTTON MANUFACTURERS.

in reputable baling, and the most conspicuous example of wastefulness to survive a century of condemnation will have succumbed, several generations after thousands of comparatively insignificant economies have attracted assiduous attention.

The European movement, previously referred to as being still in force, has accomplished the double purpose of holding in check what would doubtless have been an even more disastrous "run-away" cotton market; and of demonstrating that a large over-production of goods really existed though many new mills were built upon the fascinating returns of older corporations for several preceding years. These new mills—some of them never having started—must be taken into consideration when future estimates of productive capacity are tabulated. Similar conditions are now imminent in America but American methods are in such contrast that the struggle is more likely to be short, sharp and decisive, with results varying in seriousness with the continuance of present marketing propensities at prices below possible cost of production,—unless, perchance, an almost supernatural yield from the seed now planted, on but slightly increased territory, should become unwieldy, to the discomfiture of those who undertake to perpetuate the prohibitive prices which have so calamitously affected the sales of fabrics in recent months.

The English operative who has eked out a scant living by drafts on associations during the reduced time of the past nine months, is now notified that such assistance must largely if not wholly cease, while employers are contemplating a conference with them on the subject of wage reduction of 5 per cent., which they aver the state of trade warrants. The annual mill reports generally show large losses, with few establishments indicating even small profits and the markets are exceedingly unsatisfactory.

The Agricultural Committee of the House of Representatives has reported a singularly drastic bill applying only to cotton options (ignoring similar transactions in grains and other produce) the force of which would be to abolish hedging insurance as a basis for goods contracts. By the terms of this measure it will be unlawful to negotiate any contract for purchase and sale of future deliveries of cotton when the actual delivery and receipt is not intended in good faith. It permits the bona fide owner to sell for future delivery upon making affidavit that he will deliver the cotton when grown upon lands owned or controlled by him. The prohibition of the use of all usual mediums of communication, such as mails, telegraph, telephone, cable or wireless, will effectually prevent transactions except by virtue of accompanying affidavits, though providing that the sellers may "swear ahead" for six months, filing with transmission agents their advance omnibus oaths in lieu of the signed, sealed and sworn documents with each message. The penalty for failure to deliver or receive the actual cotton is a fine not to exceed one thousand dollars and imprisonment from one to six months; and such a failure is deemed prima facie evidence that the contractor originally intended to evade the law.

Since discriminatory legislation against safeguarded contracts for cotton products is involved, would it be inconsistent for manufacturers to invoke Congress for equally stringent legislation to protect them by affidavit or otherwise against peculiarities of buyers who would cover their problematical requirements for a distant season.

Referring to the expectation expressed at the fall meeting of this Association that the Department of Agriculture would have distributed their standardized types of grades in season for discussion at this meeting, it is only possible to say that preliminary distribution will soon be made to associations, organizations of cotton men, cotton exchanges, and agricultural colleges in the cotton states for the purpose of familiarizing the cotton trade with the official cotton types. When this distribution has been effected, a more general one among cotton dealers and producers will be undertaken.

The official cotton grades have been adopted for the purposes of trade by the New Orleans Cotton Exchange, and similar action is being considered by the New York Cotton Exchange.

Several new ideas are being embodied in the types as they will be issued, chief among which are the protection of the grades issued by photographs, and vacuum storage of the standards and approved copies for guidance in future years.

Each grade box contains twelve samples of cotton representing as nearly as possible the range of diversity in the grade. Inasmuch as any extraneous matter or material unevenness in the surface of the cotton is depicted in the photograph, it is evident that should the cotton be changed in appearance, that fact can be determined by comparison with the photograph. The seal of the Department of Agriculture and the signature of the Secretary, together with a seal impress certifying the grade of cotton will appear on the photograph.

A series of experiments has been carried on, as a result of which it has been found possible to produce vacuum tubes each large enough to hold a single cotton sample. Twelve such tubes therefore will take care of one grade. By this means the cotton can be kept for an indefinite period of time without suffering from the effects of atmospheric or climatic changes, or from light.

There will unquestionably be a growing interest in scientific contributions of the Agricultural Department where fuller information is freely given on the subjects of cotton culture and standardization.

HIGH COST OF LIVING.

The frequency of attacks on corporations which are of sufficient size to be noticed by reformers in state and national capitols, and the continuous fire of stimulating publicity in the press upon the subject of high cost of living have, unodubtedly, created a widespread conviction that something must be done by someone who is not now doing it, to check the progress of upward tendencies in a large range of commodities.

With rare exceptions all master economists are in perfect accord as to the underlying reasons for inflated prices, and if they are right the occupation of the savior of the world's populace from the

unhappy cause must needs be capable of barricading the gold producing properties against the insufferable greed of owners, whose selfish dispositions force upon an unwilling and rebellious people too much of what has long been accepted as the best monetary standard.

These authorities declare that every other cause is incidental, and would have barely noticeable effect were the precious metal not in excessive supply; while the watchword, "back to the soil," carries conviction to the mind of millions who discover that farm products constitute the chief elements of increased household costs.

Cattle, sheep, hogs, grains and cotton are no longer produced in the per capita quantities of the nineteenth century, and are inadequate to meet present consumption without the inevitable phenomena accompanying the law of supply and demand.

Acceptance of these natural conditions as existing, and acceptance of any of the propositions advanced to account for apparent hardships, cannot satisfy the contention that the American citizen (though statisticians are in conflict as to the sizes of relative earnings and expenses), can and does live on infinitely higher planes than can those of any other country.

It is fair to assume that with unprotected cotton at from five to fifteen cents above normal prices, with goods selling at no time on a basis of one-half that advance, and at present very much less than half, our own industry at least is not open to censure, even as a contributing cause.

The tariff, with necessary revision on a few constructions—compulsory if any similar goods were to be made at all by American workmen,—has not been so changed as to affect prices of cotton goods, while the disparities in labor costs are even greater than during most periods of tariff revision.

It is quite clear that constant employment of bread winners in every occupation is the most practicable solution of the vexed problem with which nearly everyone is confronted.

The ceaseless high cost agitation—largely political—defeats all hopes of speedy enlargements of trade, in consequence of which the continuance of employment, particularly in textile establishments, is not altogether encouraging.

Notwithstanding cumulative evidences which have given color (and somewhat somber color) to the foregoing statements, there is the reassuring belief that during the comparatively short history of America and her dominant institutions, of which this association represents one, the several chastenings "as by fire" has ever resulted in refinement and reinforcement of natural aptitude, moral fiber, and the dynamic mental and physical forces which characterizes our countrymen.

Patience is the all-important virtue in the present conflict which appears to have its foundations in meddling legislation, and to have derived its impulse from political machinations.

There are always to be found frightened and timid politicians who falter at inopportune seasons and for the time being depress markets without reason or justification.

These conditions now exist and time alone will satisfy buyers who were made ultra conservative by the experiences of 1907 that cotton goods will not be made for a very long period at such absurdly meager margins, if indeed serious losses are avoided, when fall contracts are made from the unknown crop.

Incomplete as this final address of your president is in other respects, it shall not be so in its expression of appreciation and admiration of the splendid achievements of appointed committees, who have devoted many hours of invaluable service, when the taking of those hours called for sacrifice of time in their businesses and meant to them a proportionally increased intensiveness.

The stability of most associations and civic institutions is, in a large measure, determined by conscientious devotion of those who are called to assume responsibilities ofttimes of inestimable importance to an industry, a state, or a nation. The members of special committees of this Association are entitled to the warmest commendation of mill officials and selling agencies, as well as of buyers and converters, whether or not on our membership rolls.

The next thing on the program was an address by President Richard C. Maclaurin, of the Massachusetts Institute of Technology, who in closing made the following excellent suggestion which cotton manufacturers could adopt with great advantage, bringing practical manufacturing and science together under the most favorable of circumstances:

Richard C. Maclauren's Address.

President of the Massachusetts Institute of Technology.

If I may be permitted one word more with reference to the Institute of Technology, I should like to say that it has already done something by means of its research laboratories to promote the advancement of the great industry in which you are all vitally interested. In these laboratories various investigations have been carried on bearing on the causes of spontaneous combustion, the fire resisting power of different materials, and various other problems connected with fire prevention. In addition to this there have been tests on methods of "carding" and of "drawing," investigations on the qualities of different yarn in connection with a paper to be read at this meeting, besides numerous chemical researches bearing on problems of importance to the textile industry. I recognize, however, that vastly more might be done if manufacturers would more regularly refer such questions to the Institute for investigation. We have laboratories equipped for researches in mechanical, electrical, chemical and other branches of engineering. To take a single example, our department of chemistry is staffed with over fifty experts, among them being men of national and international reputation. We have a section specially devoted to the consideration of problems bearing on chemical industries. And we are ready to undertake researches at the instigation of in-

terested parties, not as a money-making device at all, but simply to help on the development of the resources and industries of the nation. We place our laboratories and the service of our experts freely at the disposal of manufacturers of the country, asking nothing in return except the actual cost of the investigations undertaken. Here are evidently great possibilities for advancement; but without your hearty cooperation we can affect little for the great national industry that this Association represents.

Papers read at the various sessions are given below. The paper by James Hope, of Rouen, France, was fortunately made possible by Mr. Hope's arrival in this country a week before the date of the meeting. We learn that he has made arrangements with several of the leading cotton machinery builders in this country to use the Hope ring frame attachment on a royalty basis:

A Substitute for Cotton; and a New Method of Operating Ring Frames.

JAMES HOPE, Rouen, France.

In compliance with a request I am showing you substitutes for cotton, both in the yarn, and in plain and dyed piece goods, and also in combination with worsted.

This is made from spruce wood pulp by a process invented by a Frenchman, and is called La Soyeuse, and arrangements are being made for its extensive production in both England and on the Continent, but I understand that it is not as yet manufactured in this country.

Although it is termed a substitute for cotton, the samples will indicate that it does not have the identical effect, as it takes on dyes, bleaching and finishing more brilliantly than the cotton fiber.

It will resist boiling in water or caustic potash solution for some minutes without change and its combustibility is certainly no more rapid than that of cotton. The cost of its manufacture is much lower than that of the market price of cotton. The fiber can be made of any length, as in the case of artificial silk, which it does not resemble in other characteristics, being, as was stated above, highly resistant to solutions. The strength of the yarn apparently exceeds that of cotton, although I have not any comparative tests.

A NEW METHOD OF OPERATING RING FRAMES.

In order to make this paper interesting, it is well to remark that the ring frame had its birth on a commercial basis in the United States of America. It was eventually taken over to Europe and adopted. At that period 5-inch lift was the vogue with the Rabbeth spindles, which were run at about 6,000 to 6,500 revolutions per minute.

The French and Continental spinners were not long contented with this state of working, principally, because the short length of yarn wound on each bobbin, the tubes of which were of wood 3/4 to 7/8 inches diameter to spin 32s on 1 5/8 inch diameter rings. To improve on this 6-inch lift frames were adopted and wooden tubes completely abandoned and substituted by paper tubes of about 5/8 inch diameter.

Separators were applied to prevent the excessive ballooning and the vertical type proved the most efficient. Long frames are universally adopted which average 460 to 500 spindles each with the view to giving more spindles to each tenter. These frames are driven by long belts 60 to 80 feet long over guide pulleys to avoid as much as possible any slippage or loss of power and a type of guide pulley has been invented by which the lengthening out of the belt is automatically taken up, so that once a belt is put on it does not require any further attention for years. Before this was known some spinners adopted a system of control, by having the front roller speed taken every morning and marked up at the end of the frame, so that when the superintendent passed through he could at once detect if any loss was taking place through slippage of belt. These points were to obtain as near as possible a maximum production. I may also here point out that two tin rollers are always applied to European frames in order to have longer spindle bands with more frictional contact with the whorls. This results in a great economy in banding and ensures more regular twist; where only one tin roller is adopted two spindles would be driven by one band.

Ring cleaner, a mechanical contrivance, has been invented by which a frame of 500 spindles may be cleaned in 20 minutes by one person. This operation under present conditions takes two or three persons three to four hours, using much waste, petroleum, etc., which are not required with the new device.

Flexible and high-speed spindles are now universally adopted, but spinners cannot take the maximum advantage out of them with a constant

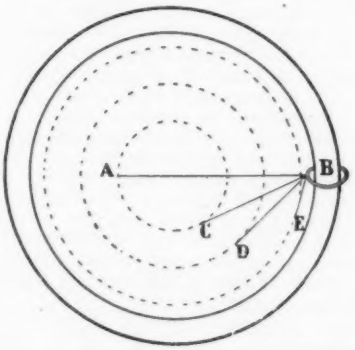
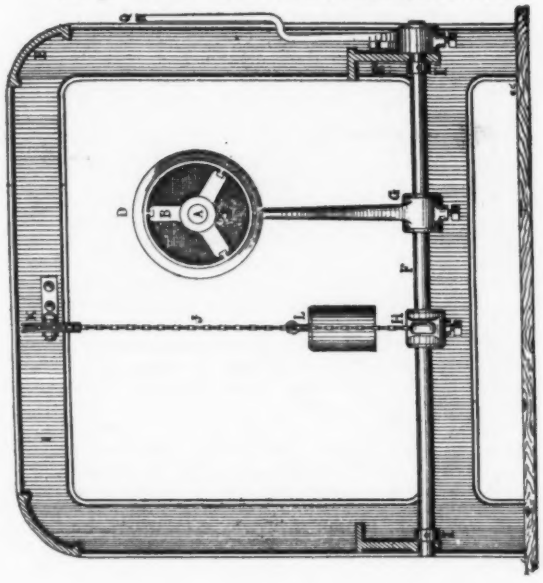


Fig. 1

speed drive, but to profit by this it is necessary to adopt a variable speed drive. As every student of ring spinning knows that the weakest part of the yarn is at the roll before it has taken any twist,

and a limited speed has to be resorted to, the cause of this is due to the extra strain on the yarn, resulting from the acute angle (A B C)

FIG. 3.—ACCELERATOR FOR RING FRAMES, END VIEW.



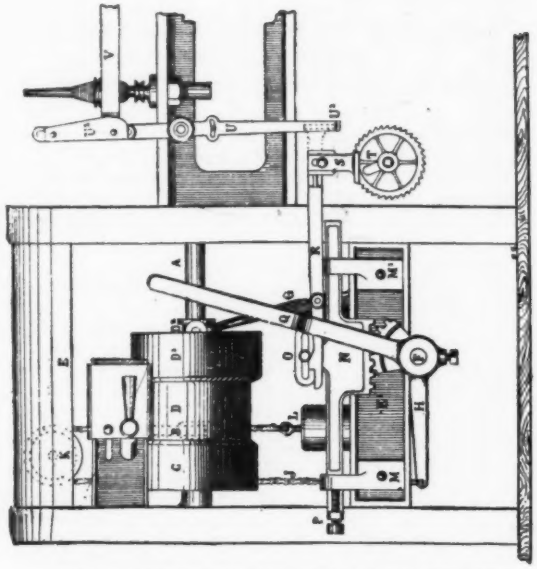


FIG. 2.—ACCELERATOR FOR RING FRAMES, SIDE VIEW.

formed at this stage by the thread, but as layer upon layer is wound on, say at the angle A B D, the frame may now be run at a 10 per cent. higher speed without any detriment or more breakage of the yarn. Many devices, both mechanical and electrical, have been tried to attain the required acceleration with more or less success.

The patent accelerator, which will now be described, has been most successful and over 600 are now at work and giving entire satisfaction, obtaining an increased production on an average of 7 to 9 per cent.

This invention consists of a sliding pulley having two diameters and a clutch screwed on the driving shaft and some other mechanism readily understood from the sketches 2 and 3 (see description). As soon as the ring plate arrives at the high level, with the cop bottom at full diameter, it pushes the lever, U, towards the left; the same movement releases the bracket, S, bringing it in contact with the cam shaft, T. Up to this movement the smaller diameter of the sliding pulley has been lodged inside the loose pulley, C, but by means of a weight, L, and chain, F, fastened to the lever, H, connected to lever, G, the sliding pulley is brought in the position shown on Figure 3.

As it has been seen, it is a substitution of pulley, which acts automatically at a certain time. When the cop bottom has been formed by the pulley of large diameter, that is to say, at the highest possible speed during the critical period, the adjustable movement comes into action automatically, and brings the pulley of small diameter slowly under the strap. This produces an acceleration proportional to the relation existing between the two diameters of the pulleys. This substitution of pulley is made automatically without jerk or removal of the strap

The increased speed is brought on gradually, and without breakage of yarn, and that is the most important point. Experiences have been made on numerous frames, on which the accelerator has been applied for more than two years, and the increase of production has been put down from seven to nine per cent.

The patented motion can be applied to any make of machine in a few hours. This will be readily undersoood on referring to the sketches. There is no other complication than the lengthening of an inch or two of the headstock; there is no extra part to oil; no extra wear or tear of machines is to be feared, the sliding pulley being connected to the driving shaft by a strong clutch which does away with the use of pins and of any other part likely to tire. And then, as the acceleration only comes into action when the running of the frame has become easy, and the breaking of yarns less frequent, the amount of waste is no greater than previously. The yarn is wound close enough to form a firm bobbin.

For the spinning of the cops or of the weft, it might be necessary to come back to a slower speed towards the top of the tubes; nothing is easier with this variable speed movement. It would only be necessary in this case to bring the larger pulley under the strap, at the proper time.

To grasp properly the advantages and the importance of the automatic accelerator with double speed, it is necessary to notice that, during the

period of the total formation of the bobbin, the ballooning of the yarn is not constant, that is to say that from the time of the beginning of the spinning until the complete formation of the cop bottom, or othewrise until the full diameter of the bobbin has been reached, there is no ballooning of the yarn, which fact proves that during this period, the tension is at its maximum. It is this precisely which has always been an obstacle to the increase of speed of spindles. This excessive tension is explained by the acute A B C of Figure 1, as already seen. But passed this critical period, the ballooning of the yarn takes place, and this has made the use of anti-ballooning separators (blinkers) necessary. It is now seen that the strain on the yarn has diminished considerably and it is so until the end of the doffing.

Consequently, admitting that he cop bottom has been formed at a speed of 10,000 revolutions per minute conveniently, in spite of this excessive tension on the yarn, there is no harm in increasing the speed of 1,000 revolutions to form the remainder of the bobbin, seeing that, in spite of this increase of speed, the conditions of spinning are still more satisfactory, it being impossible for this acceleration to bring about the suppression of the ballooning.

In order that the increase of speed should bring us back to conditions as unfavorable as during the period of formation, it would be necessary, at least in theory, to attain a speed such as would make the ballooning disappear again. Besides, it must be remembered that with the automatic accelerator, it is necessary to use lighter travelers than usually.

Spinning is made under the following conditions:

The rings being provided with travelers two counts lighter, the formation of the cop bottom at a speed of 10,000 revolutions is improved owing to a reduction of strain on the yarn, and from the time when acceleration takes place the lightness of the traveler is compensated for by the air resistance resulting from the increased speed as well as by the decreased friction, but multiplied by a larger surface covered.

Constant Speed Drive	Speed Front Roller 1 inch	Yard Produced.	Waste.
1 week	140 revolutions	640.2 lbs.	5.32 lbs. = 83 per cent. waste
1 "	153 "	697.4 "	7.50 " = 1.04 " " "
Variable Speed Drive.			
1 week	140/153 revolutions	688.6 "	6.95 " = 88 per cent. waste
1 "	153/168 "	756.6 "	7.5 " = 1 " " "

It is then seen that this lighter traveler used with the accelerator must be considered as a traveler of variable weight.

In reality, in a frame working at a constant speed, the air resistance, the development of the surface of friction covered by the traveler, must be considered as constant. It is not the same with the accelerator, when the varying speed acts on the traveler.

When frames are driven by short belts I introduce an ingenious device in the strap guide itself of a small tension pulley, and when the strap falls on to the smaller diameter pulley the tension pulley takes up the slack and maintains perfect adhesion.

Power absorbed. Experiments have been made, and it is calculated that for the extra power used, compared with the extra production obtained, it is in favor of the accelerator, and that yarn can be spun at 0.022 francs per kilogram, or 2/10 of a cent per pound cheaper than constant speed.

Disadvantages. It has been argued that it is a disadvantage to take up more space by lengthening the headstock, but this is outweighted by farsighted men that the advantages of obtaining more production are not to be neglected.

Comparisons have been made as to what is the limit or maximum speed that twist ring frames may be run on constant speeds; on say 32s, from good American, and at 10,000 revolutions the waste bill begins to show notwithstanding the extra fatigue to the tenders, but higher speeds may be run with a variable speed motion, as the following data will show, as being taken seriously and conscientiously on the same frame, in the same room and with the same tenter, a week's average for each trial being taken.

From the above data a lesson may be taken how to obtain the best results, as the above speeds are above the average, but by adopting a more moderate speed, say 130 revolutions at the front roller to build up the cop bottom, and 142 revolutions to finish the cop, a good production of yarn may be obtained with a minimum of waste. This may be easily achieved and at little cost by adopting the mechanical variable speed motion, without displacing the vertical position of the belt.

Buying and Handling of Steam Coals in New England.

JOHN S. LAWRENCE, 89 Franklin St., Boston, Mass.

The object of this paper is to familiarize New England textile manufacturers, with the economic waste existing in the mining, shipping and burning of coals coming to this section, and to throw some light on the possible solutions of these problems.

In 1908 New England's total coal consumption was about 24,000,000 tons of 2,240 pounds each, for which over $100,000,000 was paid. The exact statistics are not obtainable, but it is estimated that there was an increase of approximately 100 per cent. in the steam coal consumption in ten years from 1898 to 1908. Of this enormous quantity, approximately 8,600,000 tons were anthracite and 15,400,000 tons bituminous coal. Of this total, 16,000,000 tons were discharged at New England ports, while 8,000,000 tons were received all-rail from the mines.

In the entire United States, where the popula-

tion and area approximate 5 per cent. of the globe, there is consumed over one-third of the coal consumed in the entire world.

New England's coal supply comes from the North Appalachian fields of Pennsylvania, Maryland, West Virginia and Virginia. This field is the richest and most extensive one in the world. In general the hardest coal is found close to the backbone of the Allegheny ridge, and as one travels northwest and southeast at right angles to the mountain ridge, the coal becomes softer and more volatile. It is for this reason that coal is usually known from the place where it is mined, as the geographical location closely indicates the character of the coal to be expected.

In passing I want to say that there is deplorable waste in the mining of coal, but I am glad to say that this matter is now under careful consideration by the United States government.

That part of New England's coal supply which comes by rail is loaded on cars at the mouth of the mine, shipped over the originating lines to the junction with the New England roads, along the Hudson River; Boston & Maine at Mechanicville or Rotterdam Junction; Boston & Albany at West Albany transfer; Central Vermont R. R. and Rutland R. R. at Rouses' Point; N. Y., N. H. & H. at Jersey City or Maybrook Junction, and it is carried by these lines to the consumer or local dealer.

Rail and water coal, commonly known as tide-water coal, approximately about 70 per cent. of our supply, is loaded on cars at the mines, shipped over the coal roads in train-load consignments to seaboard, a distance of from 200 to 400 miles. The principal ports of shipment are Newport News, Norfolk, Philadelphia and Baltimore. At these ports the coal is dumped from piers into sailing vessels, barges or steamers, and transported to the various ports along the New England coast, where it is delivered direct to such industries or dealers who have discharge plants at tide water, or else transferred through semi-public discharging plants (most of which are closely associated or owned by the New England railroads) to cars for reshipment to interior New England points.

The price of best bituminous coal at the mouth of the mine has varied in the last six years from $1.60 to less than $1.00 per ton, while some West Virginian coals average at the mine as low as 96 cents per ton. The average cost to carry this coal to New England consumers is about $2.50 per ton —consequently the best coals usually find their way to our New England furnaces.

The all-rail coal rates, if plotted on a map, will be found to follow in general the contour of the water line of New England, and the highest point will be found to be about fifty miles from the coast.

The cost of tide-water transportation is therefore the determining factor on rates, so let us consider the expensive method employed with that which might be used under efficient common ownership.

1. Vessels vary so in type that a standardized loading plant is not practicable. The sailing vessels' cargoes must be carefully trimmed, while the modern coal barge or steamer has its hatches so arranged and its bins so constructed that comparatively little trimming is necessary.

2. The unloading at destination suffers from the same trouble. Modern open hatched vessels can be unloaded with ease compared with the older types. The arrival of sailing vessels is irregular, and frequently laden vessels have to lay in port for days awaiting their turn, so that unloading plants are at times forced beyond their economic capacity, and at times idle, yet these sailing vessels carry a large per cent. of our water-borne coal, operating themselves cheaply, but putting others to great expense. The more modern vessels being more expensive can less afford to lose time in waiting their turn or unload at any but the most modern plants.

3. Due to this irregular unloading New England railroads cannot be expected to keep sufficient equipment to meet the busy days, and many times cars not adapted for the purpose must be used. Long demurrage on cars, four days being allowed to comply with the laws of some New England states, is due to lack of standardized unloading facilities at the plants themselves. One plant requires side dump cars, one bottom dump, while others shovellers, which makes economical operation of railroads impossible and prevents those consumers using modern plants from benefiting by the economy to which they are properly entitled, with the result that even at the high rates, New England railroad earnings on coal are extremely small.

The Boston Chamber of Commerce last year in their report entitled, "The Buying and Handling of Steam Coal," compiled a most interesting table showing the comparative analyses of coals from different sections, as represented by some 2,000 samples. It is well worth every coal buyer's study.

Recently three hundred postal cards were sent to textile mills throughout New England inquiring their consumption of coal and certain other questions of interest for tabulation. The number of replies received was 115, which in total represented 936,080 tons. Distribution of the above tonnage was as follows:

Massachusetts	629,376
Rhode Island	141,704
New Hampshire	48,160
Maine	43,200
Connecticut	42,400
Vermont	31,240

About ten who replied did not know what kind of coal they were using. Of the 115 replies, 50 stated that they had facilities for handling modern dump cars, and of these who had modern facilities the dump cars supplied by the railroad were as follows:

14 were supplied with between 75 and 100%
2 were supplied with between 50 and 75%
2 were supplied with between 25 and 50%
4 were supplied with less than 25%
20 did not specify.
8 were supplied with none.

Twenty-two representing a total tonnage of 79,-

365 tons were located on the line of the railroad, who for lack of facilities had to shovel from the cars by hand, a wasteful process not only for themselves but for the community.

The sources of coal purchased by those replying were as follows:

Mining District.	Tons Tonnage.
New River	269,360
Pocahontas	183,520
Clearfield	65,000
George's Creek	14,640
All others were	403,560
	936,080

We cannot blame the railroads for these conditions, unless it be their duty to popularize modern methods, for which they are only indirectly responsible. They have greater interest in the fuel for New England than any of us, and their handicap in this connection is shown by the fact that the average per cent. of cost of operation paid for fuel figured from the 17 largest railroads of the country in 1907 was 11.20 per cent., while on the Boston & Maine R. R. it was 17.10 per cent., and on the N. Y., N. H. & H. R. R., 14.06 per cent.

One showing evils should also endeavor to show the means of rectifying them; and in this connection I would suggest four remedies:

1. Establish a standard for coal carrying vessels and for loading and discharging plants.
2. Use only such vessels between these standardized plants as can maintain a regular schedule.
3. Establish standard unloading plants throughout New England, for the prompt unloading of cars, and standard railroad equipment, adapted to meet the more regular demands.
4. Careful study by experts on the burning of coals and experiments to ascertain which brings the best results.

Today coal purchases are too often made on recommendations by the firemen without proper study of conditions, variations in price, conditions of transportation, analyses of coals and modern methods of firing. Coal buyers should always insist on receiving the bills of lading to prevent substitution.

It would be desirable to form a representative New England commission who, after a careful study of this subject, would recommend standard equipment and suggestions, together with the best methods of popularizing them, with the idea that changes and new equipment might conform to a general scheme, in the same way that a far-sighted manufacturer would lay out his property.

In this connection the situation at Hamburg, Germany, is interesting; a number of steam producers formed a voluntary association for study of their fuel supply and employed experts for testing of fuels and experimental modern firing, handling and reduction of smoke, with the object of attaining the highest possible efficiency. All plants are examined, studied, recommendation made, firemen and buyers educated, and it is claimed to have accomplished a great saving and each plant is well pleased with this corporative work.

Railroads have standardized their gauges and their equipment to a marked degree, and this in spite of many owners of different interests, a situation not so difficult as the one suggested in this paper. Where a tangible saving of this kind can be made, a great part of it usually accrues to the consumer, and of the enormous coal bill of New England—$100,000,000 (which in 1920 will probably be $200,000,000)—a small per cent. of saving would amount to millions of dollars a year, and being everybody's, it is nobody's business to bring about quick, reasonable public economies, the lack of which contributes to the high cost of living.

The Distribution of Artificial Light.

FRANK MARSHALL SCANTLEBURY, 93 Broad Street, Boston, Mass.

The subject of illumination by artificial means is of vital importance to everyone interested in the advancement of prosperity. Prosperity because the welfare of our nation is based upon its commercial standing among the nations of the world, upon the ready market for all its products and the ability to supply the best the world can produce.

This is especially true with our textile industries, which at the present time lead the world in the amount and quality of their productions. Ever increasing, the demand for American fabrics constantly exceeds the supply.

In a single word, the success of this particular line of industry can be summed up in "progress," the determination to keep constantly improving upon the old methods.

Of weaving, to be able to see the economy of improvements, that are to result in a superior product regardless of the cost of installation. Of better buildings, of better ventilation and last, but not the least in importance, beter illumination.

It is undeniable that the light in the textile mill of today is of greatest importance. If we compare the modern mill with its present day weave shed and the stuffy weave room of the past we find a great difference. In the former, we will find that not only the sides of the building are literally one sheet of glass, but the roof is constructed 50 per cent. of ground glass, allowing just as much light to enter as possible, with the result that the interior is as bright as the average greenhouse. In the old shed the aim seemed to be to crowd as many looms into one building as possible. Therefore you will find mostly all the older buildings three and four stories high and in certain sections so dark that artificial light is necessary at all times.

Perhaps the most surprising thing in this connection is the apparent disregard of artificial lighting and the crude methods in existence in some of the big mills. It would surprise a good many people were they to know that some fifty large mills are using gas for illumination in New England alone, and were we to stop and consider that, with the improvements recently made in the electrical field, they could not only secure a much better light but could increase their efficiency 50 per cent. at a saving of about 25 per cent. in dollars and cents over gas, it will be difficult to understand

why the illumination of yesterday is still in existence.

There are, however, mills who monthly sacrifice thousands of dollars through sheer waste of illumination. It is a safe estimate that some $20,000,000 worth of illumination is wasted yearly in the United States alone. Not as we might suppose by neglecting to extinguish the lights that are not in use or in other ways, but rather by the failure to control illumination.

In industrial fields the lamp most generally used is the old carbon and of this type the 16 candle power style predominates. The current consumption of this lamp figured in watts, which is the term used to measure the electrical energy necessary to produce light, is 3.5 watts per rated horizontal candle power. Therefore, if this lamp produces 16 candle power the amount of current it requires is 56 watts, 1,000 watts equal 1 kilowatt, and the rate for a kilowatt hour varies from three to fifteen cents.

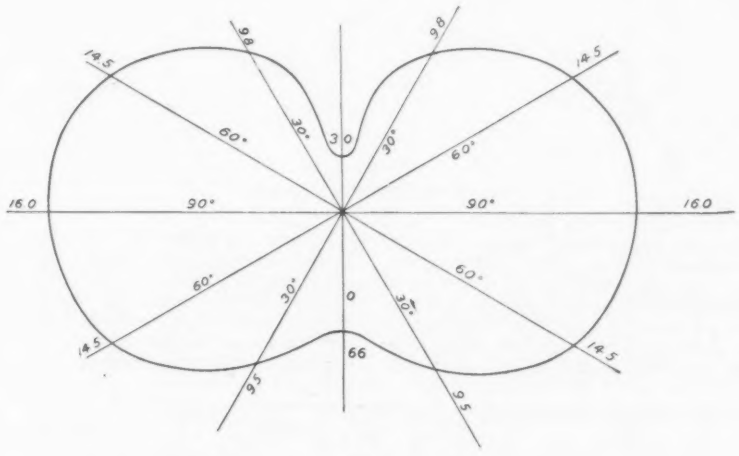


FIG. 1.

The Gem lamp is an improved type of the carbon lamp, having, however, instead of a carbon filament a carbon filament heated to such a degree in an electric oven that it takes on the properties of metal and hence the name, Gem "Metalized Filament." This lamp requires but 2.5 watts of electrical energy to produce one rated horizontal candle power and it gives out a good, strong, white light. About two years ago the Tantalum lamp made its appearance on the market. This lamp was named after the metal that constituted its filament, the filament being spun on what is known as a tree, supported by a glass pole. This particular type of lamp had the advantage of consuming but two watts of electric energy to produce a candle power and in addition to this was a very strong lamp and would stand a great deal of hard usage. This latter feature, however, was only true when the lamp was burned on a direct current line and experiments showed that the filament could not stand the alternating current line in a satisfactory way to any extent whatsoever.

This lamp had hardly had an opportunity to become a popular addition to the commercial world before the Tungsten and Mazda lamps made their appearance. In both these lamps we find the very highest developments in the electric lamps of the present day. They give, perhaps, the whitest and best artificial light that has ever been discovered next to actylene gas. For comparing color values the light given by these lamps is superior to all others, as they show up color values when used in conjunction with a good reflector almost equal to daylight. Perhaps the most surprising thing is the low consumption of current necessary for them to produce light, they requiring but 1.25 watts per candle power. The popularity of these lamps among the textile trade is increasing daily, and it is safe to say that the day when they will replace the carbon lamp is not far off.

Illumination, however, and light are two distinct and separate things. For instance, a room may be well lighted but poorly illuminated. Light is the cause, illumination the effect, and unless we control our illumination we are virtually throwing money away.

For example, the carbon lamp of the 56 watt type used in most of our mills is termed a 16 candle power lamp, and by 16 candle power we mean that directly off the horizontal we are getting 16 candle power while directly off the end of the lamp our end on candle power amounts exactly to 6.5 candle power. In Figure 1 we have what is known as a photometric curve of a bare 16 candle power lamp.

It will be noticed that directly beneath this lamp we get the second smallest fraction of our light, 6 5/10 candle power, and it is directly beneath the lamp in almost every instance that we require our best light. This fact is generally known and to remedy it a flat enamel reflector, usually the

cheapest tin reflector made, is placed directly over the light. The results obtained by doing this is to redirect three candle power into the horizontal and does not result in building up the end on

the light source will present itself to the eye. In the case of reflection by the aid of prisms, as shown in Figure 2, the light leaves its source, A, enters the prisms at B, strikes the critical angle

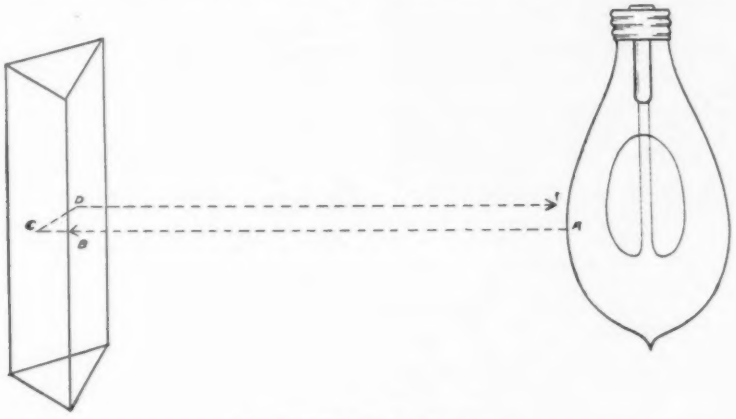


FIG. 2.—REFLECTION BY PRISMS.

candle power to any appreciable extent. Illumination can be concentrated or spread over a large area in exactly the same manner as water in a hose. If concentration is required a reflector made of glass prisms produces astonishing results and this system so positively controls the light rays that almost any distribution or concentration can

at C and from there is reflected across to point D, this being a critical angle reflects the light back again to A. It can, therefore, be readily seen that by keeping the angles of the reflector the same uniform size throughout its entire length and by curving them the spread and distribution can be regulated according to the requirements.

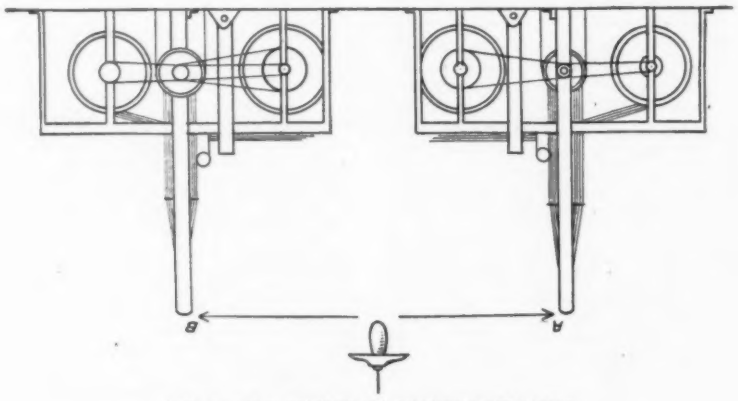


FIG. 3.—OLD METHOD OF ILLUMINATING LOOMS.

be accomplished by its use. This principle of the control of illumination by glass prisms is based on the discoveries and experiments of Messrs. Blondell and Psaroudaki who originated the system. In all highly polished surfaces there exists what is known as a cririca angle of reflection. This may be illustrated very easily by a clear piece of glass or any bright surface if it is held on an angle of about forty-five degrees beneath any artificial light, an image, or in other words, a reflection of

The use of glassware, however, in some cases is not advisable owing to the possibility of breakage and the effort to discover an opaque reflector of strength and efficiency equal to the glass reflector has been the constant aim of all interested in better illumination. This is, however, a very difficult problem and it is doubtful whether this will ever be accomplished.

The most durable and efficient proposition in opaque reflectors on the market today is one that

has gained its entrance into hundreds of the foremost mills in the country. This reflector embodies all the very latest developments in the science of reflection and vies with the prism glass reflector in the control of light. It is constructed of steel spun into shape by hand over a wooden chuck which is scientifically considered to have the correct curves and to possess the shape best adapted for control of light. The spinning process has the effect of leaving the interior surface porous and when the reflecting surface, which is of absolutely pure aluminum is applied it is annealed in such a manner that the aluminum works itself into the porous places and gives us a reflecting surface which is known as a "mat or satin finish." This is the very finest reflecting surface known, for in addition to its reflecting a very strong light, it has a distinct advantage of being able to whiten the yellow rays of a carbon lamp to a very large extent and also diffuse them.

The best illumination given forth from an opaque reflector is that given from an irregular reflecting surface. In other words, a surface that will break up and scatter the light rays while reflecting them. If we will examine the reflection given by a polished reflector we will find that there exists what is known as streaks and striations, and while these may not appeal to the laymen as being particularly objectionable or harmful, if we will take the trouble to investigate the result that they have upon the eye we will find that it is of vital importance that they be eliminated.

Upon examination we find that the eye is equipped with a very delicate member that closely resembles the shutter of a camera. This member is known as the iris and its purpose is to regulate the amount of light that is admitted into the eye. Now, if we will examine these streaks in our reflection, we will find that there are light and dark spots. Imagine then, for example, a condition existing where there is the least vibration. The result is that back and forth over our work we have these striations continually moving. The eye must follow and adjust itself as each light and each dark spot passes in front of it. It is possible for this to continue for perhaps an hour, but eventually it is unable to keep up and the result is that the eye is severely strained. Long continued, this results in permanent injury. The eye cannot see as well as it did at first, consequently defects in material are allowed to pass unnoticed, and we look at our spoilage and wonder why the amount is greater during the seasons of lighting than it is at other times. If this one small point were investigated it would be found that poor reflectors were responsible for at least one-quarter of the spoilage. Good light means good work, and the man who tries to economize at the expense of his operatives' eyes finds that it is a very unsatisfactory method.

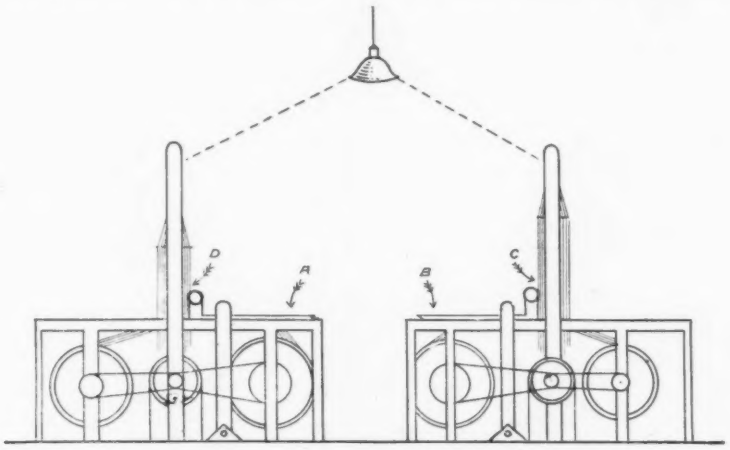


FIG. 4.—ILLUSTRATING LIGHT PLACED WHERE NECESSARY BY PROPER CONTROL OF ILLUMINATION.

Distribution and control of light by opaque reflectors is accomplished entirely by their science in design and lamp position, so that in order to fully control the light given from a lamp it is absolutely necessary to cover at least three-fourths of it with a reflector. This is due to the fact that our greatest light is given off at the horizontal and it is essential that this be controlled. We will take for example a condition existing where there are two looms placed facing each other as shown in Figure 3 used for the purpose of weaving narrow cotton cloth. The manner used at the present time to illuminate these two looms is to hang a carbon lamp about six and one-half feet from the floor directly between them and to place above the lamp a flat tin reflector. This has the power of redirecting three candle power into the horizontal and illuminating brightly the upper part of the loom, or in other words, that part of the machine that is directly in line with the horizontal light.

In Figure 4 we have a steel cone reflector hung in exactly the same position and we find that the

light is thrown strongly down on the shuttle and on the harness, the two most important parts of the loom.

However, if a stronger downward light is required this may be accomplished by the aid of a concentrating type of a steel reflector shown in Figure 5 used individually over separate machines without any additional current being required, using instead of 16 candle power lamps 8 candle power lamps, which will give a light beneath equal to that given by the common tin cone shade and 16 candle power lamp.

There is an S-I type of the same bowl reflector that will give us 68 candle power from a 60 watt lamp directly beneath. This reflector used over sorting tables and inspection tables is found to be a particularly good type. At the angle of 45° our reflector gives us 69 candle power. In all cases where the Mazda and Tungsten lamps are used it is absolutely necessary to use a reflector that will conceal the light and reflect the light. The extreme brightness of the lamp makes it very difficult for the eyes. The lamp must be protected by some strong covering, and the extremely small

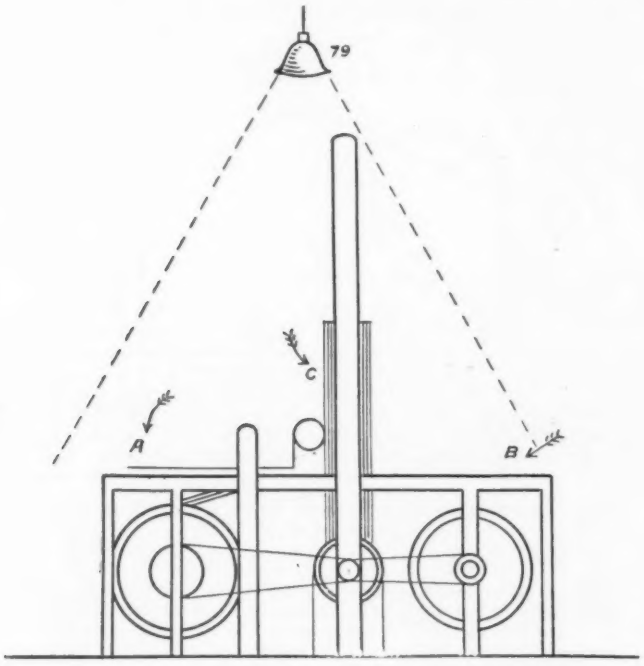


FIG. 5.—LOOMS LIGHTED INDIVIDUALLY BY SEPARATE REFLECTIONS.

By using the Mazda or Tungsten lamps in conjunction with the new bowl type steel reflector we get an exceptionally fine light. A reflector known as the S-E-60 will give us at points A and B when used with a 60 watt Tungsten lamp 66 candle power, while at points C we have 35 candle power. In Figure 6 we have an example illustrating two spinning frames lighted by an S-E-60 and a 60 watt lamp. By experiment we have found that we can use this same combination to illuminate four cotton looms. Here a remarkable saving is shown as the lamp consumes but 4 per cent. more electricity than a 16 candle power, carbon lamp does, and we find that our light by actual photometric test on our looms is about 300 per cent. better than with the carbon installation. This is the only opaque reflector known that will give this peculiar curve and it shows the possibilities within our grasp by its use in conjunction with Tungsten or Mazda lamps.

end on candle power which gives us hardly any downward light when used without a reflector must be built up.

There are, however, numerous requirements for general illumination, and where the units are well up out of reach of operators glass reflectors of an extensive type which are broad in distribution and yet allow no waste at the horizontal are used to good advantage.

The use of arc lamps has proved in so many cases to be such a poor solution to the problem of general illumination in textile mills that their use is not encouraged. They give what is known as spot lighting in addition to flicker and mechanical troubles, and the aim in all general illumination is to produce an even and steady distribution of light. Large units in the Mazda and Tungsten types are also inadvisable unless they are used plentifully or high above the floor, as they produce the same effect as arcs and render sections of the

room absolutely dark should they give out at any time. The scheme of laying the units out of squares is found to be the most satisfactory way of solving the general illumination problem in textile mills, and this plan is advised wherever that style of lighting is desired.

It is usually advisable in cases of general illumination to call in the service of one who is experienced in this line of work. The services of an illuminating engineer can always be secured gratis from any of the big concerns who are specialists in the lighting field. Of course there is always a feeling on the part of those who are contemplating an installation that by soliciting the services of any of these concerns they involve themselves and are placing themselves under direct obligation to the people from whom they are asking favors. This, however, is not so, and while there may be a few concerns who will use this as a means of securing business, there are, at the same time, some most responsible concerns who consider it more of a favor than otherwise.

It has been the desire of the writer to word in just as plain a form as possible this entire subject and to avoid technicalities in all cases, but in treating upon a subject that in any way whatsoever refers to illumination, it is rather a difficult thing to entirely avoid this, but the subject of illumination, especially to mill men, is so well known that the few technical references will not cause confusion.

The best manner of illumination in textile mills has proven to be individual or group lighting from a large number of distributed small units, and it is for this reason that it has been dwelt upon more than on other schemes. Mill men are realizing more and more every day the vast importance of satisfactory artificial illumination and it is a safe estimate that the best lighted mills in the world are found in the United States. However, there still remains plenty of room for improvement, although the strides made in this field within the last few years have been surprisingly great, but within the next year we will see developments that heretofore were undreamed of, due to improvements and appliances now being perfected that in the course of a few months will make their appearance to the electrical world

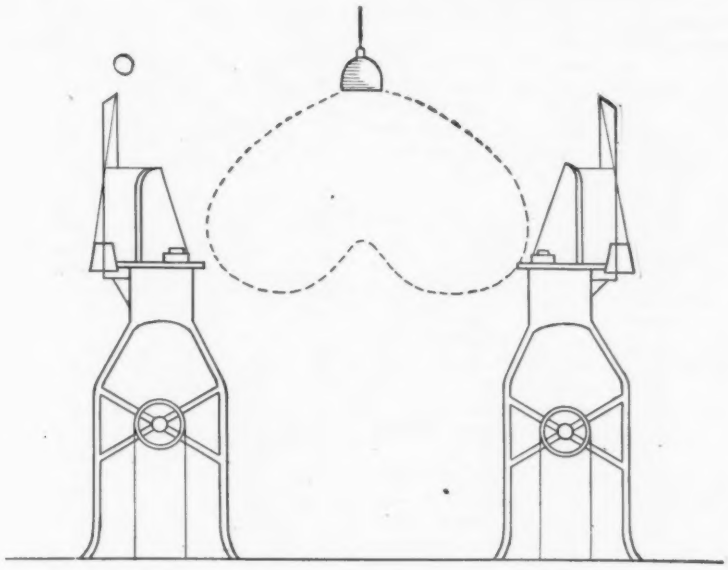


FIG. 6.—S. E. TYPE OF STEEL REFLECTOR USED TO LIGHT TWO FRAMES.

Sizing of Vegetable Fibers.

HERMANN SEYDEL, 81 Steuben St., Jersey City, N. J.

The great development of the sizing industry is directly traceable to the increasing demands placed on the weaving of fabrics. These demands can be classified into three groups, the first production, the second perfection and the third finish of the cloth.

The production of a given number of looms in so far as the size is concerned, depending almost wholly on the tensile strength and the elasticity of the warps, is more closely watched by the size maker than the other two requirements, and I shall give you below some figures which will show you the importance of a good sizing compound in the dressing of warps.

The quality of perfection of the cloth depends greatly on the proper handling of the sizing materials: the boiling of the size and the mechanical aptitude of the slasher hands being almost as important as the judicious choice of the materials used in the making of the size.

As for the finish of the cloth, the basic question is the choice of starch, the amount used and the greater or smaller percentage of softening or stiffening agent required. Taken as a whole, this is by far the easiest part of the dressing of warps once the properties of the sizing materials are known and thoroughly appreciated.

As long as the hand loom represented the only means of weaving, the matter of sizing remained very simple and the sizing of warps, if any was done, affected the finish of the cloth more than its quality or the quantity woven. The size was then home-made and what little softener was needed was added to the flour after it had been more or less converted into starch or, to be more exact, after the starch had been separated from the gluten through the cumbersome process of fermentation.

With the advent of the power loom, and especially with the popularizing of the automatic loom, the manufacturers began to exact vastly more than plain dressing and the first step to meet this condition was to secure more even starch. This demand for good starch is now partly met by the factory prepared starches and it is my opinion that if starches were made wholly for the textile trade the mills would be able to buy a much better cornstarch than the average mill is now buying, for I find as a general rule the better graded or clean starches are now sold as food products and in my inspection and analyses of mill starches I have found quite a number containing not only gluten, but also some alkali to counteract whatever acids would develop through fermentation. You can readily see that this addition did not add to the quality of the starches by any means.

The quality of the starch being very important, I have every cause to believe that in the very near future considerable improvement will be brought into this industry and I am pleased to state that a long step has been taken in this direction by the manufacturers of so-called soluble starches. The drawback to soluble starches is that the converting of starch into its soluble state has not yet been so perfected that the textile manufacturer can count on receiving the same article year in and year out without fear of deterioration in storing, but when the processes will have been perfected, I am sure that the mill men will find many advantages in the soluble over the thick boiling starches.

This, however, is looking not only into the future; but also into the manufacture of starches and while of great importance to you is scarcely within the realm of the cotton industry and I prefer to speak further upon the subject of sizings.

To begin with the main ingredient in all sizings, which are applied on vegetable fibers, let me say a few words concerning starches, for it is my desire to answer the gentleman who had the privilege your last meeting at which time they extolled the advantages of corn and potato starches over one another. Afte‍r carefully considering their arguments pro and con, I cannot see where either were right, for as the kind of starch used in the sizing influences the finish and feel of the cloth, it is clearly up to the manufacturer to make the choice regardless of either the manufacturer of starches or of sizes, but it has been my experience that many manufacturers in endeavoring to economize in the size account very often produce goods which do not meet in hard times with as ready a sale as the goods otherwise warranted.

It is very evident for instance that on a warp which is to be made into a fine and closely woven sheeting or lawn which should feel smooth on the face, the weaver will find potato starch superior to corn on the other hand the duck or osnaburg man will take none other but good corn whereas carpet warps are probably more economically sized with starches ground from other bulbs such as cassava or tapioca.

As the kind of starch is therefore dependent of the feel or finish required of the goods the mill man himself is undoubtedly the best judge of what will more readily meet his requirements, but after he has reached a decision on this point he is confronted by the deficiencies of the starches themselves. One will object to the cornstarch boiling too thick, the other that the potato starch will on continued boiling lose its viscosity, the third that the tapioca or cassava will dust off considerably. These deficiencies are inherent with the starches and can be overcome only by the action of some chemicals or the addition of some gums without which no size of real good quality can be made.

The task of the maker of sizes is therefore confined to the overcoming of these defects and the proof that he is meeting with success is shown by the very great development which his industry is undergoing, especially in this country and on the continent of Europe.

In this country the growth is due to the extended use of the automatic loom which forces the manufacturers to employ the very best material obtainable, in continental Europe and especially in Germany it is due to the close study of

details and the demand for successful and economical results which is so characteristic of their enterprises.

In England the development is not quite as great and I attribute this condition to three reasons: the first being the natural conservatism of the English people; the second, that the demands on the warps are not as great on account of the embargo of the automatic looms by the labor unions and the third by the almost ideal climatic conditions of an island whose shores are constantly washed by the Gulf Stream, its atmosphere being conditioned winter and summer by nature itself.

The difficulties in the way of compounding ideal sizes are many, as not only do the character and kind of the ingredients depend on the class of goods the size is made for, but the conditions of the plants themselves, both atmospheric and mechanical, require that a very close study be made of the subject, and that the proportions in which these ingredients are mixed should be governed by these conditions.

Only very recently I have had the opportunity to verify this statement by a test made in one of the largest mills in New England where I had an opportunity to help overcome the over frequent breaking of the warps on some Northrop looms. On examining the yarn as well as the atmospheric conditions of the mills I found it very evident that while on account of the character of the goods no more twist should be given to the warps, the improvement was to be made in the slashing, as no amount of attention on the part of the weavers would have overcome the havoc brought on by the steel heddles and stop motions.

Taking these conditions into consideration it was evidently up to me to improve on the size and I did so with the gratifying results that during an average daily run of ten hours the breakage decreased from 315 to 255, or about 20 per cent. This was done not so much by the changes which were made in the sizing materials, but by the proper adjusting of the proportions in which a dozen or so ingredients which went into the making of the size used by these mills before my visit.

Since then these conditions have improved further by the elimination of a greater part of the lint and the production has not only increased in yardage, but fully as much in weight and quality.

To further emphasize the importance of the size in weaving let me give you the figures reported to me by a very thorough mill superintendent of a successful mill. This mill used in making up its size the following formula and the tests were made on 30s warps run from 13/16 inch staple cotton as follows:

Eighty-five pounds of corn starch, 10 pounds of sizol boiled up to 160 gallons. This gave an added weight of 9 1/4 per cent. and an increase in breaking strength of 17 1/4 per cent.

The second test was made with 80 pounds of corn starch and 15 pounds of sizol boiled up to the same 160 gallons. This gave 9 1/2 per cent. of added weight and 18 per cent. increase in breaking strength. Thus the adjusting of the proportions in the size kettle resulted in one-fourth of one per cent. added weight and three-fourths of one per cent. increase in breaking strength which caused a further and marked improvement in the quality of the cloth and its production; and I cannot urge the mill men too strongly to make similar tests and find out exactly where they stand.

Another test of interest is the money value test of sizol and tallow, the sizing being made as follows with accompanying results:

Eighty pounds of starch, 15 pounds of sizol, added weight 9 1/2 per cent., increase in strength 18 per cent.

Tallow 12 pounds, starch 85 pounds, increase in weight 8 1/2 per cent. and breaking strength 15 per cent.

This is figuring the cost price in favor of tallow and still you notice a difference of 1 per cent. in the weight and 3 per cent. in the breaking strength in favor of sizol. These differences were still more apparent in the finished cloth, as not only did the production of cloth sized with sizol average 5 per cent. over that with tallow, but the weight of the fabric was 3 per cent. less with tallow than with sizol. This further difference in weight being due to the excessive shedding which took place from the warps treated with tallow.

It may also interest you to learn that while warps sized with sizol and starch gain 9 1/2 per cent. in weight and 18 per cent. in strength, warps sized with corn starch alone with 95 pounds to 160 gallons gain 8 1/2 per cent. in weight, but only gain 10 per cent. in strength. Warps wetted and dried lost one-eighth of 1 per cent. and 2 per cent. in breaking strength. The latter two of these warps were not woven, but were resized and I cannot, therefore, give you further details as to the results which would have been obtained.

From the above figures two deductions can easily be made, the first that tallow is not a sufficient addition to the starch to make a perfect size; the second that it behooves all weavers to use the very best product they can find for their size kettle; and the fact that the results are so evident makes it easy for the superintendent or mill owner to form a very adequate opinion of the relative merits of the sizes on his warps.

I have often been asked, by people old-fashioned enough to have their hearts set against using anything which they do not quite understand, what the mills should use in making up their sizes, and I have no doubt but that many among those present have paid high prices for formulas which have proven absolutely worthless, much to the astonishment of the one who paid for the formula and relied on someone with little experience or knowledge to apply this one formula to meet the changing conditions of the market.

This reminds me of a trip made by a German patentee not so long ago, who for a certain sum offered to initiate mill men into a secret of chang-

ing their starches into a mixture of starch and dextrine by previously treating the starch with a diluted solution of chlorine. This in itself was not a bad idea and our German friend, who was an expert in this line, convinced more than one manufacturer of the beauties of his process, especially those who made goods where this particular process helped them secure the desired finish. As soon as the experienced chemist left and the process was to be continued by a less experienced scientific brother, or an even less experienced slasher hand, the converting of the small part of the starch into dextrine became so uncertain that I do not know of a single mill in this country which is still using this process, and I repeat here what I have told a great many mill men, that it is absolutely useless for them to buy formulas, as not only will their chemist wish to make perpetual changes, but the slasher hands themselves will, unbeknown to the manufacturer and his help, vastly improve what they consider an absolutely wrong conception of an art which they think they know best.

In advocating that you rely on the maker of sizing materials I ask that you consider not only his wider experience of the subject, but also the necessity to secure even results as to quality and finish of your cloth, and I have no need of reminding you that the very important point of production depends as much on regularity in the warps as on any other conditions of the mills.

In order that you may realize that the choice of sizing materials should be made judiciously, I shall give you a few words of advice concerning some ingredients which are used to little or no advantage. First I shall mention some chemicals, and wish to divide same in acids or acid salts and in alkali or basic salts.

Of the first group alum is a type, and this salt being to all practical intent an acid, causes the starch to boil thin, which in some cases is good, but its disadvantages are so great that neither alum nor any other acid should ever be used in the making of the size. The first disadvantage is that it activates fermentation, with the result of more mildew. The second, that on account of this fermentation whatever size is left over night or over Sunday is more harmful than of good use, and the third reason is, that under continued boiling the starch is converted into dextrine, and as this process goes on as the warps are run through the size, the first end of the cloth will be sized more heavily than the last. The last, but none the less important, reason for eliminating all acids from sizings is that they attack all metal parts, rusting the reeds and harnesses and thereby causing chafed warps and many breaks.

Basic or alkaline salts. Among these I have found in actual use caustic potash and soda as well as soda ash, sal soda, borax and soaps. The use of alkali or alkaline salts as well as soap is probably an inheritance of the times when the starch was home made and the alkali was used to neutralize the acid caused by the fermentation. Such conditions, however, do not exist at present and under no circumstances should alkalis ever be used in the slasher box as they lump the starch and prevent the size from penetrating, causing a very great loss in shedding. Strange to say I have found more alkali used among carpet mills than elsewhere in spite of a very bad effect, which is known to all handlers of jute, of the alkali on this fiber, and whereas the dyer eschewed all alkalis from his dye bath, for some reason or other the size maker had inherited a notion that good carpet warps could not be made without spoiling the fiber.

Among neutral salts are found the chemicals which are of decided benefit to the size maker, but these should be chosen most judiciously, for the haphazard mixing of chemicals will produce results far worse than can be conceived by the uninitiated, and thereby constant danger of one not thoroughly acquainted with the subject using these chemicals without regard of their action or suspicion of the trouble which so often follows.

The use of coap which was so general a half a century ago and which is to be commended in the finishing of fabrics should be discontinued in the size kettle, as on account of the lumping of the starch very uneven results are sure to follow. There is, however, another objection which is far greater and which is probably due to the very nature of soap itself, for it is well known that warps treated with a size containing soap will when freshly sized appear very well and even weave well, but when these warps are older a considerable dusting off of the size takes place and while one end of the bolt has the required stiffness the other is usually flimsy and lacks in body and weight. This with the unevenness of the face due to the shedding is the main reason why the use of soaps should be discontinued.

Closely related to the soaps are the sulphonated oils such as turkey red oil, soluble oils and corn oil softeners, these oil softeners having the further disadvantage over soap of producing a discoloration in storing, and it is very advisable to keep from using all such oils, for they not being refined, will on being stored have the goods acquire a color which is extremely difficult to bleach out or to overcome the dyeing, and which color detracts considerably from the appearance of cloths sold to cutters in the gray.

Among fats I have found some vegetable oils used, but on account of the present high prices of these oils scarcely any are used at the present time except perhaps some little cocoanut oil, but this should never be used, first because it has absolutely no advantage whatever over tallow, and second because of its many disadvantages, the principal ones being its low melting point and the readiness to become rancid, acquiring in the oxidation a strong and pungent odor which the converters find hard to eliminate.

There remains but two more ingredients on my list; the first being tallow, and as it is used to a very great extent, and in fact more extensively than any other fat as an emolient in the size kettle, same should be chosen with care both as to its kind, quality and purity. The market tallow often contains lard and veal or mutton suet, all of which are not of good use, and the latter is

especially obnoxious on account of the strong odor which it acquires on storing. The lard and veal suet are not as desirable as beef tallow on account of their low melting point, and it is therefore important that purchases of tallow should be made with the provision that it be good beef tallow of high titer, the low titered tallow not being of much use, as it does not give the warps the stiffness or body which is necessary that the warps should have to withstand the hard usage on the looms.

The most important cause of trouble in the weave—and especially store-room, is that the average commercial tallow contains a considerable quantity of albumen and gelatine, the latter coming from the bones, the first from the blood which accompany the fats into the rendering kettle and these two ingredients should be by all means eliminated before the tallow is added to the size kettle, as both gelatine and the blood are among the best producers and carriers of fungus existing, and I have no doubt but what most of the mildew is caused by these impurities in the tallow. The fungus brought in the size kettle by the tallow is thus scattered over the cloth and if same be not absolutely dry, it feeds most readily upon the starch of the sizing and the gum which is part of all vegetable fibers, and if this growth is allowed to act on the goods long enough, the cloth can neither be dyed nor bleached properly, but will rot in spots and entail considerable loss.

Paraffin wax, while having one good quality in its high melting point, its faults are so many that its use is very limited. By separating from the rest of the size it sticks to the warps in spots and this, as you know, causes so much trouble in the bleaching and dyeing that it is hardly worth while mentioning this material.

Besides the above there are quite a number of chemicals, fats and other ingredients which I have found in the slasher-room which in most cases either cause an absolute waste or seriously interfere with the successful production of a good piece of cloth, and I have no doubt but what you will agree with me that as the subject is much more complicated than it used to be, it is indispensable that the problems be solved, not by the slasherman whose knowledge of chemistry is necessarily limited, nor by the chemist who cannot be expected to devote as much time and study as is necessary to achieve good results, his time being already taken up by the more essential duties of his analyses of fuel, coloring matters and other such materials which alone demand a great deal of his attention.

Another and probably the most potent reason for buying ready-made sizes is that through the wide experience which the maker of sizing materials acquires in his studies of sizing problems and his visits to textile plants all over the country he is enabled to give to the manufacturer a much more up to date material of greater efficiency, which will help the manufacturer secure the highest production as well as the best goods with the required finish.

Production Increasing Methods—Training Workmen.

HENRY L. GANTT, 120 West Fifty-seventh St., New York

There are two ways only of increasing profits, one by increasing the selling price, the other by reducing the cost of production.

In as much as the former method yields more prompt returns, and returns that can be measured with great accuracy, much of the talent of our manufacturers has been engaged in this branch of the business. The successful salesman, or the operator who has succeeded in persuading his competitors to join with him in upholding, or advancing prices, has on account of the increased profits resulting from his efforts, been considered a very important man, and been compensated accordingly. The recognition of ability and the compensation for success in this field have been so great that capable workers from all directions have swarmed into it, and the industry of making prices has prospered amazingly.

With increase of prices comes higher cost of living; with higher cost of living comes demand for higher wages; with higher wages comes higher cost of production. Then to maintain the same profit under the new conditions, we must again increase our selling price, and the cycle repeats itself. This process has been going on for years, and as the producers have gradually been attracted from the field of making products to the more lucrative one of making prices, today we have a surplus of prices and a shortage of products. The field has been overworked.

Let us now consider the other alternative, that of reducing cost, and ask why more attention has not been paid to it, and what we may expect to get if we cultivate it as assiduously as we have done the first.

The first cause is that it cannot be done in an easy chair behind a mahogany desk. It must be done in the factory amid the dirt, the dust and the noise of machinery. It must be done by not only studying individuaily the machines that do the work, but by also studying individually the men that operate them. This is work that requires quite as much, if not more, ability than the making of prices; it also requires long hours and overalls; and the compensation for success does not compare with that accorded the man who adds to the bank account by manipulating prices.

On account of these conditions this branch of the work is usually delegated to the partially educated mechanic, or clerk, who if he is very successful, may get the princely salary of one hundred dollars per month.

When the compensation for success in this branch is made commensurate with that in the first, and then only, will it attract and hold the men most capable of doing the work successfully.

Study of men and processes is difficult, and we have done but little in this country to encourage it; but the time has come when we must turn our attention to it at once, for the combination of the high cost of living and the inefficiency of

production is rapidly producing a condition of which no one can foresee the result.

The horizontal increase of wages being granted by so many corporations throughout the country is not a cure, but an expedient only to enable the workmen to supply themselves temporarily with a larger proportion of the necessities of life. Such a scheme provides temporary relief only, for a general increase of wages increases costs again; and if such a policy is followed, it will not be long before a new increase of wages will be needed to meet the continually rising cost of living.

The one cure, and the only one for the condition that confronts us, is to increase the efficiency of the producer. This is not an easy problem and there is no royal road to the desired end, for as was said before, it means long hours and overalls, and the ability to study men and machines in the surroundings of dirt, dust and noise.

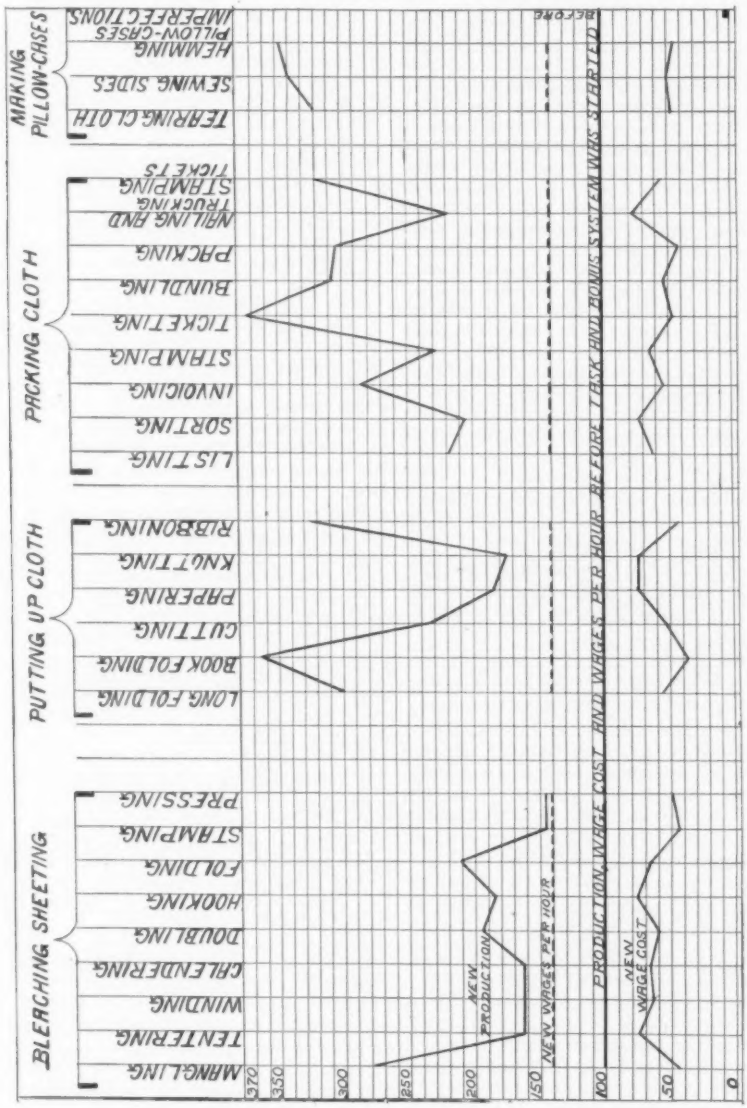
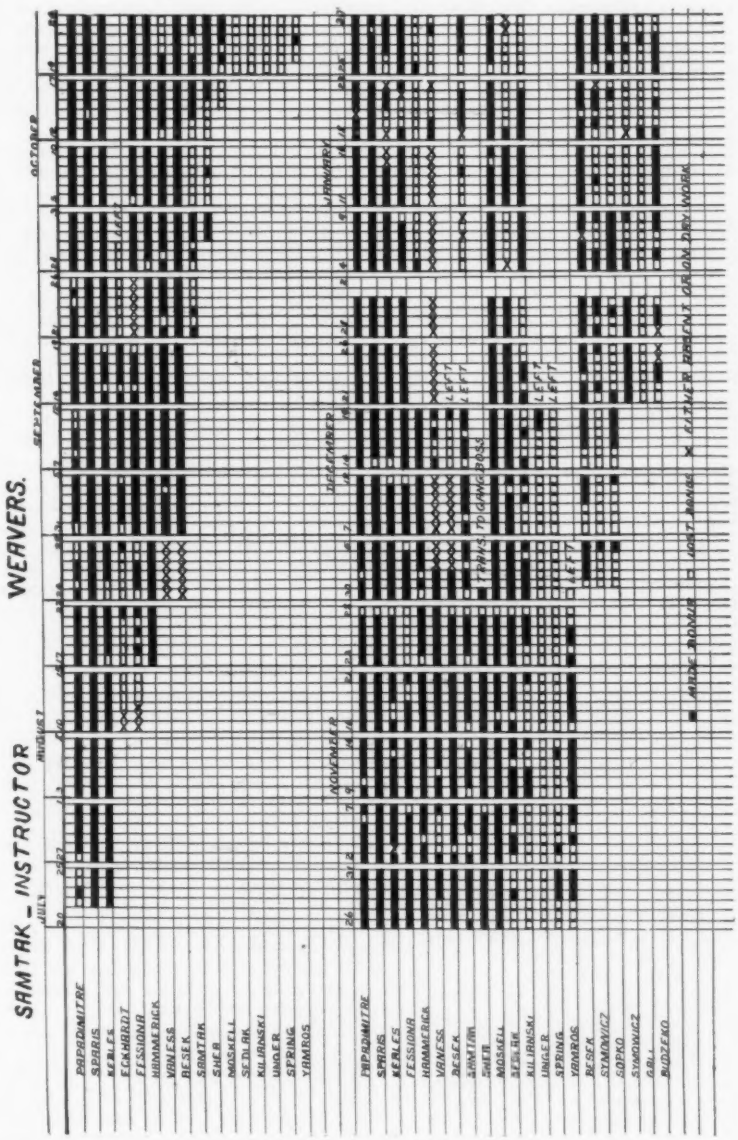


FIG. 1.—BENEFITS OF TRAINING.

As was said before, this work does not attract many educated or capable men because the compensation for success is so meager; but the time is rapidly approaching when the men that can do the work well will be in demand at almost any price. This is peculiarly the work of the mechanical engineer and the manufacturers that realize this fact and take advantage of it will be surprised at the benefits they obtain.

It is an economic law that large profits can only be permanently secured by efficient operation; and any man, or body of men, that exacts a compensation out of proportion to the service rendered will ultimately come to grief.

The supreme importance of efficiency as an economic factor was first realized by the Germans, and it is this fact that has enabled them to bring their industrial condition, which twenty


SAMTAK - INSTRUCTOR
WEAVERS.
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
LEFT
TO DAMAGE ROOM
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LEFT
LEFT

years ago was a joke, to the first place in Europe, if not in the world.

A few years ago efficiency was a local question; today it is a national question and cooperation for its promotion will not only be of great permanent benefit to those cooperating, but have a great educational effect on the nation at large.

It may be interesting to glance at some of the methods by which efficiency has been increased.

There are in nearly every factory a few workmen who are much more efficient than the average, and we all realize that if we could only get the average efficiency up to the highest efficiency, our output would be greatly increased and our profits increased in a much greater ratio.

Few of us, however, realize how much greater this ratio would be. In many cases our efficient worker can do twice as much as the average, but he seldom does it, because as a rule he isn't satisfactorily compensated when he does. If by any means the amount of work done by the average worker can be doubled, and the output of the plant increased correspondingly, the profits will, unless they are already very large, be increased at least 300 or 400 per cent., even though wages may also have been increased 50 per cent.

It was a thorough appreciation of this fact that enabled Andrew Carnegie to become the dominant factor in the steel industry, and to amass his immense fortune.

These facts, which can be readily verified by applying them to any ordinary manufacturing business, indicate in the clearest possible manner, the desirability of increasing the efficiency of our workmen. Moreover, the profits to be derived from such an increase are so great that the manufacturer cannot offord, as has been too often the case in the past, to trust to "picking up" suitable workmen when he needs them, or to hiring them away from his neighbor; but must make proper provision for training such workmen as he may need. A method of doing this in a prompt and satisfactory manner is one of the greatest of our industrial needs today.

Many managers have recognized this fact and are establishing schools for the combined education and training of workmen. So far, however, they have been able to make but a comparatively small addition to the number of workmen needed. If we wish to train workmen in large numbers, the practice must become much more general.

In this connection it is interesting to note among the members of the Honorary Japanese Commercial Commission which made an extensive tour around this country last October under the auspices of the Department of State, and also the Department of Commerce and Labor, were a number of Japanese manufacturers, one of whom, Mr. Nazaro Tatatsuji, a member of this Association, brought with him a number of copies of an illustrated book describing the extensive cotton mills with which he is connected.

In this book were illustrations and descriptions of the textile school, which he in common with other Japanese manufacturers had established in connection with their mills, showing that this very acute people appreciated the value of the school and of well trained workmen to such an extent that they considered a proper technical education as a necessary adjunct of mills for the manufacture of cotton goods. In view of this fact it may be well to review the basic principles on which such training must be founded to be successful, and then to show what results may be accomplished. Before the advent of the modern factory system, each master workman owned his little shop, which he ran with the assistance of two or three journeymen, and in which he personally superintended the training of his apprentices.

In training apprentices, his first object was to provide himself with capable journeymen; but he also realized that the best way to increase his reputation was to send forth men that should be a credit to him. He was therefore doubly particular that those he trained should be able to do their work well. With the coming of the factory system, the owner became too busy to give much personal attention to the apprentices, and as the factories grew larger, he was often unable to take from the business end enough time to make himself a master workman in all branches of his work.

With the increasing size of the factory, the superintendent also became too busy to give much personal attention to the apprentices, and they were thus left to receive their training from the foreman and their fellowworkmen, who have no financial interest, as a rule, in training additional workmen who might, in time, become their competitors. This is undoubtedly the most important reason why the old apprentice system has gradually become less effective, until today it is almost obsolete. It is also a good reason why an attempt to revive it in its old form is foredoomed to failure.

The principles on which the old apprenticeship system was founded are sound, namely, that the success of the pupil should add to the reputation and financial betterment of the teacher and pupil both. It would seem, then, that if our modern methods have a similar foundation, they also will be successful.

Moreover, if the training is based on the results of scientific investigation, and the methods employed are those which embody our best knowledge on the subject of teaching, we should be able, not only to provide ourselves with an abundance of skilled workmen, who are capable of doing well the tasks set them, but develop many who are able to advance the mechanic arts in a manner superior to that which gave the New England master workman of a generation ago such a wide reputation.

For several years past the writer has been training workmen on the lines indicated above, and although his work has usually been with people older than the ordinary apprentice, his results have been successful to a degree entirely unanticipated.

About five hundred of those so trained are textile workers who are now earning an average of 40 per cent. more than previously, and turning out over 100 per cent. more work. The average wage cost per unit has been reduced to about 60

per cent. of what it was, and the total cost to a much greater extent.

Fig. 1 represents graphically the results of this work in a number of specific cases.

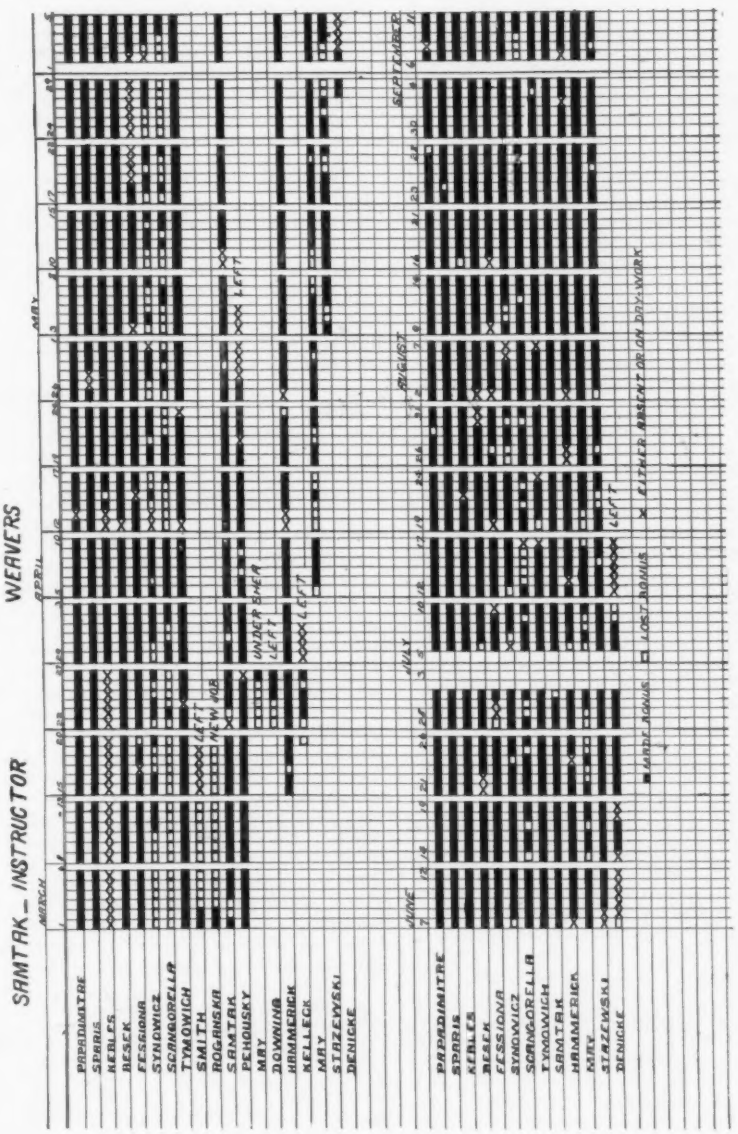


FIG. 3—TRAINING WEAVERS.

In this diagram, the condition before the training was begun is represented by one hundred; the new condition is represented as a percentage of the former.

If, then, the ordinates of the unit line represent the previous output, those of the upper irregular line represent the new output. It will be noted that the new output ranges from 50 per cent. to over 200 per cent. greater, averaging in the cases shown over 150 per cent. greater.

On the same diagram, assuming the previous wage cost as unity, the new wage cost is only about 60 per cent. of what it was, while the new hourly wage on the same basis is about 40 per cent. greater than the old.

We have thus increased the output over 100

per cent., reduced the wage cost 40 per cent. and increased wages 40 per cent. Inasmuch as inmost cases this result has been obtained with but little permanent increase of general expense, it may be realized that the profits have been increased to a degree that is hardly appreciated at first sight.

The diagram represents various classes of work, the first being that of the several operations of finishing and folding sheeting in a bleachery. The second class of work is that of sorting and packing piece goods from a storehouse. The third class is that of folding and putting up "fancy" goods in a bleachery. The fourth is that of running sewing machines, making sheets and pillow cases. In the last case, the increase was so uniformly great, that one immediately feels that the work must have been done in a very inefficient manner before. It unquestionably was, but probably not much more so than is often found when the work is left entirely in the hands of a foreman whose only qualification for the job is the recommendation of one of his friends. The methods inaugurated by the writer in this factory are being extended by men trained under his direction, and soon all the operations will be done efficiently.

This diagram covers only a few textile workers, but the results that have been obtained in machine shops are quite as pronounced. One other result, which was to be expected in a general way, is that the trained workman, working under expert teachers, should also produce better work, but we were not quite prepared to find the extent to which this was so in some cases.

In the Sheet and Pillow Case Factory (represented on Chart 1) we were enabled by a fortunate combination of circumstances to get a measure of this increase, which was so surprising that we hesitate to take it as a fair sample. However, it may be taken as an example of what may happen.

Soon after the establishment of these methods in the sheet and pillow case factory, there was a complaint from one of our customers that our work was bad. An investigation proved that the complaint was well founded, and about 50 cases of sheets and pillow cases were returned. On inspecting them it was found that while there were a great many defects in some cases, others were practically free from defects. After this fact was noted, an exact record was kept of all the defects in each case still to be inspected, with the following result.

In twenty-eight cases done before we put our new methods in operation, the number of defects per case averaged 47 1/2. In two cases done while we were starting the new methods, and before we got proper inspection in operation, the average number of defects per case was two. In eleven cases done after the new methods were installed completely, the average number of defects per case was less than one.

The comment on this naturally is that the work was originally done in a very careless manner, which is undoubtedly so. The interesting fact is that such an unsatisfactory condition could be so quickly remedied. The results that have invariably followed the proper application of these methods are such as to make us feel that we are on the right track, and warrant a closer inspection of the methods themselves.

If we wish to improve the ordinary workman up to a point where his work compares favorably with that of the efficient workman, we must do so by making it to the financial interest of the ordinary workman to learn, and to that of the expert workman to help us teach, for the ordinary workman must be taught and trained. We must study the work of the efficient man and get a measure of it to use as a standard for the poorer workman to come up to.

Again, we often find that by a study of the work of the efficient man, or men, we can find a still more efficient manner of doing the work, which we can teach to the ordinary worker. Having determined the best method and the time needed by an efficient workman to do any piece of work, we set that time and method as our task, and if the ordinary workman learns to do the task in the manner and time set, he is paid a substantial addition to his day's pay.

Our efficient workman is made an instructor and receives each day additional compensation for each workman under his charge who comes up to the efficiency set.

Charts 2 and 3 show what can be done toward increasing the efficiency of workers in a cotton mill. A glance at the names will indicate the class to which they belong. They are nearly all immigrants and few can talk English, but it has been possible to bring the average efficiency up to a higher point than that of the best worker before we began our study, for the task as finally set was more than the best worker had been doing before we began to study his work.

Our method of procedure, in the weave room for instance, was to select the best weaver in the mill (in this case it happened to be a Pole named Samtak), and study day after day how he did his work and what was limiting his output. Then means were taken to remove the obstacles that had prevented him from doing more or better work. After this we again studied his work in detail, timing his various operations with a stop watch, and finally deciding what a fair task was when conditions were right. We then made Samtak an instructor, and set for the three next best weavers the task of doing each day what Samtak proved could be done.

When they succeeded they were paid a substantial bonus in addition to their day's pay, and Samtak was also paid a bonus each day for every successful weaver. While Samtak was a good weaver, he was at first a poor teacher, and our investigator who had studied his work and who was a good man of college training, was obliged to remain with him for several weeks before he became a good instructor, and able to remove obstacles that interfered with efficiency.

Charts 2 and 3 represent what we accomplished in training weavers between July, 1908 and October, 1909. The record of whether a weaver succeeded or failed in his task is represented on the chart each day. The heavy vertical bars divide

the charts into weeks, while the light vertical lines represent days. When a weaver was successful on a day his space for that day was blotted out. When he failed his space had a black line top and bottom. A cross represents that he was either absent, or had no task set for that day, but simply worked by the hour.

Note that we started with a few of the best weavers, and did not try any more until the first ones had formed the habit of being successful. Then we took the next best weavers. Note that we soon ran out of weavers who could perform our task at the start. Gradually, however, the chart became blacker as time went on until in October, 1909, nearly all of those who had been trained are regularly up to the required efficiency, which refers to both quantity and quality, for failure in either causes loss of bonus.

In addition to paying our instructor a bonus for each weaver that succeeds, he is paid additional bonus if all succeed, which has the effect of causing him to help the inefficient workman.

The mechanic who keeps the looms in shape is also paid a bonus each day for each weaver who succeeds. Every case of failure to make a bonus is investigated by somebody in authority, with the object of finding out the cause and removing it; and inasmuch as it is to the interest of all concerned to have the cause removed, he always has their hearty cooperation, with the result that the workman and foreman combine with the management to obtain high efficiency. This would seem utopian if it were not an accomplished fact.

This task and bonus method was started in the large machine shop of the Bethlehem Steel Company in March, 1901, and the results were so marked, that since that time the writer has been employed in developing and extending it. He has found the same results to follow wherever the method has been introduced.

It must not be supposed, however, that it is easy to introduce such methods, or that they can be introduced quickly. It requires time, experience, tact and persistence on the part of him who undertakes the work; and he must be able to prove to the workmen that he intends to deal fairly with them, for their confidence must be obtained before their cooperation can be secured.

What we do for the efficient workman is to enable him to become more efficient and to reward him accordingly. The inefficient workman is given a chance, and helped to become efficient with the assurance of a suitable compensation, if successful. The manufacturer can afford to compensate liberally for efficiency, and when the workman finds that he really means to do so, they are usually ready to cooperate heartily.

Many will say that it is not possible to introduce such a system into their plants, and they are right under the conditions that exist in those plants; but their system of management can gradually be so modified, that the introduction of such a system is possible. The first step is to so plan the work and arrange such a system of returns that an individual record can be kept of the work of as many men as possible, and to base their compensation on their record. Where there are no established piece rates, this will do much to insure efficiency, and the clerical work needed will be insignificant when compared with the benefit obtained.

The efficiency of a shop run on such a system of day work is as great or greater than that of the ordinary piece work shop, and the spirit of the workers much better.

This subject was discussed in a paper on "Training Workmen," read before the American Society of Mechanical Engineers, December, 1908, and is being much more thoroughly treated in a series of articles now appearing in the Engineering Magazine.

Time and space will not permit of our going into more detail, but it is sufficient to say that the development of skilled workmen by this method is sure and rapid, and whenever the method has been properly established, the problem of securing satisfactory help has been solved. During the past few years while there has been so much talk about the "growing inefficiency of labor," the writer has repeatedly proved the value of this method in increasing its efficiency, and the fact that the system works automatically, when once thoroughly established, puts the possibility of training their own workmen within the reach of all manufacturers.

The result of our twenty years' work on these lines is now being collected and will shortly be published in a book entitled, "Work, Wages and Profits."

Committee on Standard Specifications.

Fourth Report.

Since the autumn meeting of the Association at Bretton Woods, the efforts of your committee have been devoted largely, through cooperation with the Uniform Contract Committee of the American Cotton Manufacturers' Association, toward getting the members of the trade to recognize the proposed sale note as the standard form for use in buying and selling staple gray goods in this country.

Three meetings have been held in New York City between members of the trade interested in this matter and members of the committee of this Association and the American Cotton Manufacturers' Association. At these meetings it has been the overwhelming conviction that some form of contract that could be used as a standard would be of great benefit. Thus far, however, it has been difficult to harmonize interests that on the surface appear conflicting. It has become evident that, without the active support of buyers, it would be difficult to get any form of sale note generally adopted and in use within any short period of time. A committee of buyers has now been appointed to consider the matter, with fair prospects not only that its members will become interested in this matter, but that views as to details will ultimately be harmonized as between buyers and sellers and some form of sale note recognized by the trade generally as a standard for use in gray goods transactions wherever possible. Steps to this end

were taken at a meeting held in New York City on April 15.

Following the vote of this Association at its autumn meeting, enlarging the scope of this committee, its title has been changed to Committee on Standard Specifications, and Messrs. Arthur T. Bradlee, William B. Hawes and Philip Dana have been added to the committee's membership as a sub-committee to consider and report upon a standard form of sale note for yarn. Members of this sub-committee have attended one or two of the New York meetings referred to above, and have held a joint meeting with the sub-committee of the American Cotton Manufacturers' Association on yarn. The committee, however, is not ready to propose any form of sale note at present, believing that the feasibility of a sale note for yarn depends upon the outcome of the sale note for cloth.

Our yarn sub-committee, however, is not sleeping in the meantime, and in fact, has arranged for a series of tests that, regardless of the outcome of the sale note feature, cannot but prove to be of great interest and value to the trade. Through cooperation with the textile department of the Massachusetts Institute of Technology, a series of tests is being made upon yarns of various numbers and mill makes with a view to determine what the actual limits of variation in yarn are, both as to strength and number.

Your committee has the sad duty of reporting the death of one of its most interested and valuable members, Alfred M. Goodale, who died late in the evening of Dec. 17, 1909. He was intensely interested in the work of the committee, and his assistance in bringing about what has thus far been done was invaluable. He was very earnest in advocating the adoption of such a sale note by the trade, believing that great benefit would result. He was the first to use the form commercially and reported it to be a practical success. Your committee has suffered a severe loss in the death of Alfred M. Goodale.

Your committee has good reason to hope that it will be able to make a final report on cloth at the next autumn meeting, and in the meantime, asks your further indulgence and support.

A paper on the "Federal Corporation Tax Law," contributed by Walter S. Newhouse of New York, was read in part by Secretary Woodbury, on account of the absence of the author.

A paper on "Recent Advances in the Chemistry of Coal Tar Colors," prepared by Dr. Hugo Schweitzer of New York, was read by title.

Miss Mary Lios Kissell presented an interesting paper on "Aboriginal American Weaving."

Dr. D. S. Jacobus of New York presented a paper on "Superheated Steam and Super Heaters." The proper understanding of this paper and that of Dr. Schweitzer requires the publication of many tables which our space this month will not permit, but complete copies in pamphlet form may be obtained from the authors or the secretary.

At the last session on Thursday afternoon these resolutions were adopted:

Resolved: That the thanks of the Association be extended to the following non-members who have notably contributed to the success of this meeting:
President Richard C. Maclaurin,
Mr. Howard Ayres,
Col. E. D. Meier,
Miss Mary Lois Kissell,
Dr. D. S. Jacobus,
Dr. Hugo Schweitzer,
Mr. Henry L. Gantt.

Resolved: That this Association favors the buying of cotton on a net weight basis, believing that if this system is gradually adopted, the ultimate effect will be to improve the American bale by removing the inducement to use an unnecessarily heavy covering.

Resolved: That this Association views with satisfaction the extended use by manufacturers of efficient safety devices for the protection of employes from danger, and recommends that every effort be made to influence the employes to avoid carelessness which might result in injury to themselves and others.

Resolved: That the appreciation of the Association be expressed to the Textile Exhibitors' Association for the courtesies extended by them in connection with this meeting and for their efforts which have produced an exhibition of great value to manufacturers and others.

Resolved: That the thanks of the Association be extended to the Museum of Fine Arts for its hospitality.

Resolved: That this Association deprecates the present agitation for further tariff revision and points out that with the balance of trade against this country any further opening of the door to imports would tend to destroy American industries, to stop employment and reduce wages, and bring about another period of commercial depression and disaster.

At the same session the election of officers resulted in the following selection:

President: Franklin W. Hobbs, Boston, Mass.

Vice-Presidents: George Otis Draper, New York, N. Y.; Edwin Farnham Greene, Boston, Mass.

Directors for Three Years: Albert F. Bemis, Boston, Mass.; R. M. Miller, Jr., Charlotte, N. C.; Russell B. Lowe, Fitchburg, Mass.

Director for Two Years: Frederick A. Flather, Lowell, Mass. (To fill out the uncompleted term of Mr. Greene.)

Director for One Year: Frederick B. Macy, New Bedford, Mass. (To fill out the uncompleted term of Mr. Flather.)

Franklin W. Hobbs, the newly elected president, has been actively interested in the work of the Association for many years, has served on its executive committee and was vice-president last year. He is treasurer of the Arlington Mills of Lawrence and connected with other textile enterprises. He is trustee for the Commonwealth of Lowell Textile School and is himself a graduate of the Massachusetts Institute of Technology and the Bradford Technical College of England. Mr. Hobbs always takes a lively personal interest in any organization with which he is connected and the association will find in him a live president.

Edwin Farnum Greene, who was elected to the office of vice-president, has been a member of the executive committee for some years. He is treasurer of the Pacific Mills and a director in other textile corporations.

George Otis Draper was reelected as the other vice-president. He has been one of the most regular attendants of these conventions for many years past and in spite of the fact that he is no longer directly connected as an official with the textile industries, he is still a shareholder in many textile concerns and retains a lively interest in the meetings and the work of the association.

The new members admitted were:

FOR ACTIVE MEMBERSHIP.

John T. Almy, Treas. Attawaugan Co., and Treas. Totokett Mfg. Co., Norwich, Conn.
William Amory, Treas. Pepperell Mfg. Co., 30 Kilby St., Boston, Mass.
Allen C. Arey, Supt. Manville Co., Globe Mill, 86 Woodland Rd., Woonsocket, R. I.
Earl K. Atwood, Agt. Lockwood Co., Waterville, Me.
Joseph A. Baker, Treas. Chace Mills, Fall River, Mass.
William L. Barrell, Treas. Lawrence Duck Co., Lawrence, Mass.
Walter H. Bradley, Supt. Androscoggin Mills, 170 Pine St., Lewiston, Me.
Ernest Bromley, Supt. Waypoyset Mfg. Co., P. O. Box 327, Pawtucket, R. I.
Thomas Burke, Pres. Barber Mfg. Co., 199 Perkins St., Lowell, Mass.
William M. Butler, Pres. Butler, New Bedford and Quissett Mills, 45 Milk St., Room 709, Boston, Mass.
Thomas J. Cavanagh, Asst. Supt. United States Cotton Co., 27 Foundry St, Central Falls, R. I.
John A. Collins, Jr., Asst. Master Mechanic, Arlington Mills, 67 Thorndike St., Lawrence, Mass.
Morris L. Comey, Asst. Supt. West Boylston Mfg. Co., 208 Main St., Easthampton, Mass.
Edward H. Cook, Treas. Quissett Mill, New Bedford, Mass.
Harry L. Crocker, Asst. Supt. Amoskeag Mfg. Co., Market St., Manchester, N. H.
R. J. H. DeLoach, Prof. of Cotton Industry, University of Georgia, Athens, Ga.
Nicholas E. Devereux, Pres. Skenandoa Cotton Co., Utica, N. Y.
William O. Devoll, Treas. Potomska Mills, New Bedford, Mass.
Emil Dick, Agt. Barker Mill, Auburn, Me.
Albert Greene Duncan, Treas. Chicopee Mfg. Co., 70 Kilby St., Boston, Mass
Benjamin Fessenden, Treas. L. A. Lockwood Co., Pawtucket, R. I.
Andrew Fisher, Jr., Asst. Supt. Dyeing Amoskeag Mfg. Co., Manchester, N. H.
Andrew Frey, Supt. Oneita Knitting Mills, Utica, N. Y.
George A. Frisbie, Treas. Frisbie and Stansfield Knitting Co., 116 Genesee St., Utica, N. Y.
Thomas F. Glennon, Agt. Quissett Mill, New Bedford, Mass.
Beirul Gordon, Jr., Supt. Utica Knitting Co., Utica, N. Y.
Oscar W. Gridley, Gen. Supt. and Agt. Utica Knitting Co., Erie St., Utica, N. Y.
William Grosvenor, Pres. Grosvenor-Dale Co., 17 North Main St., Box 1384, Providence, R. I.
William N. Goddard, New Eng. Agt. Cotton Pub Co., 131 State St., Boston, Mass.
Arthur Hubbard, Illuminating Engineer Cooper-Hewitt Co., 220 W. 29th St., New York.
William Grove, Supt. Clinton Mfg. Co., 51 Social St., Woonsocket, R. I.
George B. Holbrook, Pres. Indian Orchard Co., Springfield, Mass.
Hubert D. Kernan, Treas. The Skenandoa Cotton Co., Broad St., Utica, N. Y.
John Lowe, Jr., Mgr., Sec. and Treas. The Montreal Cotton Co., Valleyfield, P. Q., Canada.
George E. Luce, Supt. Spinning Dept., Kavanaugh Knitting Co., Waterford, N. Y.
Langford May, Supt. Minetto Meridian Co., Minetto, N. Y.
John A. McGregor, Treas. Utica Steam and Mohawk Valley Cotton Mills, Utica, N. Y.
Adam MacWhinme, Treas. Spencer Yarn Co., Adamsdale, Mass.
Ernest L. Morrill, Agt. Pepperell Mfg. Co., 53 Main St., Saco, Me.
Benjamin C. Mudge, Vice-Pres. and Treas. Oxford Linen Mills, 28 Gilbert St., North Brookfield, Mass
George Francis Payne, Supt. Queen City Cotton Co., Burlington, Vt.
John A. Perkins, Gen. Mgr. Army and Navy Cotton Duck Co., Wilkinsonville, Mass.
Ralph C. Perkins, Pres. and Gen. Mgr. Perkins, Webster Corp., East Jaffrey, N. H.
Samuel Powel, Lonsdale Co., 180 Bowen St., Providence, R. I.

Paul Read, Supt. Barnaby Mfg. Co, Fall River, Mass.
Ray M. Sanford, Vice-Pres. W. Warren Thread Works, 58 Day Ave., Westfield, Mass.
George H. Sayward, Treas. Pemberton Co., and Treas. Methuen Co., 78 Chauncy St., Boston, Mass.
Herman Seydel, Mgr. The Seydel Mfg. Co., 81 Steuben St., Jersey City, N. J.
Richard B. Snow, Supt. Burgess Mills, Pawtucket, R. I.
Richard Toas, Supt. Edwards Mfg. Co., 44 Chapel St., Augusta, Me.
Charles H. Weare, Jr., Supt. Samson Cordage Works, Shirley, Mass.
Joseph Webster, Treas. Grinnell Mfg. Corp., 75 Thomas St., New Bedford, Mass.
C. Minot Weld, Pres. New England Cotton Yarn Co., Rm. 1029, 141 Milk St., Boston, Mass.
Robert Winsor, Pres. Gosnold Mills Co., Kidder, Peabody & Co., 115 Devonshire St., Boston, Mass.
Charles F. Young, Treas. Tremont and Suffolk Mills, 70 Kilby St., Boston, Mass.

FOR ASSOCIATE MEMBERSHIP.

Lewis F. Allen, Treas. Dinsmore Mfg. Co., Salem, Mass.
Amos M. Bowen, Treas. U. S. Ring Traveler Co., 92 Westfield St., Providence, R. I.
John Duff, Coal Merchant, of Joseph Duff & Son, New Bedford, Mass.
James Hope, Textile Machinery, 18 Quai de la Bourse, Rouen, France.
Edward D. Meier, Pres. and Chief Eng. Heine Safety Boiler Co., 11 Broadway, New York, N. Y.
Frank M. Scantlebury, Illuminating Eng., Holophane Co., 93 Broad St., Boston, Mass.
Henry F. Searles, Manager North Newport plant of the Draper Co., Hopedale, Mass.

(Continued on page 104.)

The number of cotton spindles operated in the world during the year ending Aug. 31, 1909, was 133,377,000, and the quantity of cotton consumed by them was 19,397,000 bales, indicating a weekly consumption of about 373,000 bales. In 1900 the approximate number of spindles was 105,661,000, and the consumption of cotton 15,185,000 bales, or a weekly consumption of 292,000 bales.

Not less than 9,000,000 persons are employed in the production, handling and manufacture of American cotton. Of this number, about 6,000,000 are farmers and farm laborers; about 1,000,000 are otherwise engaged, to some extent, with the raw material in the United States; while at least 2,000,000 are concerned with it in foreign countries.

THE AMERICAN COTTON MANUFACTURERS' ASSOCIATION.

The call for the meeting of this association to be held at Charlotte, N. C., on May 17 and 18, has been issued and the following program is announced:

MORNING SESSION (TUESDAY).

Call to order by President Lewis W. Parker.
Prayer—Rev. Harris Mallinckrodt, rector St. Peter's Episcopal Church.
Address of Welcome—Hon. T. W. Hawkins, Mayor of Charlotte.
Reply to Address of Welcome—T. H. Rennie, Pell City, Ala.
Annual Address—President Lewis Parker.
Address—"Warehousing Cotton in the South"—L. H. Bullard, Gulf Compress Co., Memphis, Tenn.
Discussion—Led by T. B. Stackhouse, president Standard Warehouse Co., Columbia, S. C.; W. D. Nesbitt, president Warrant Warehouse Co., Birmingham, Ala.
Address—"Excess Tare on Cotton"—John A. Law, president Saxon Mills, Spartanburg, S. C.

AFTERNOON SESSION.

Address—"The Development of the Cutting-Up Trade in the South"—H. R. Beane, president the Peter Hill Co., Atlanta, Ga.
Report of Sales Notes Committee—Lewis W. Parker, chairman, Greenville, S. C.
Discussion.
Report of Cotton Exchange Committee—Capt. E. A. Smyth, chairman, Greenville, S. C.
Discussion.

MORNING SESSION (WEDNESDAY).

Address—"Coal and Its Economic Use in Cotton Mills"—J. S. Burrows, fuel expert, Castner, Curran & Bullitt, Norfolk, Va.
Discussion.
Discussion of general topics.

BUSINESS SESSION.

For active members only. Report of secretary and treasurer. Report of Committee on Resolutions. New business. Election of officers.

Arrangements have been made for reduced rates for transportation to and from Charlotte. A certificate must be secured at the time of purchase of the ticket to Charlotte in order to get the benefit of the reduction.

In addition to the program given above the following entertainment will be provided: Base ball, reception to visiting ladies, vaudeville at Academy of Music, wrestling match, automobile and carriage drives, barbecue and dance and a trip to the electric power plant at Great Falls, S. C.

The Textile Machinery Exhibition.

The machinery exhibition of 1910 demonstrated in an even greater degree than was the case in the previous year the value of this institution. It is of value to the mill owner, the overseer and the general public, as well as to the exhibitors. No amount of written matter nor of oral explanation will take the place of an actual inspection of the machine or article that is offered for sale, and so it is that a visitor to the Textile Machinery Exhibition can in a few hours inspect machinery, processes and mill supplies which it would require an untold amount of time and labor to investigate at the business places of the exhibitors. The number of exhibits were greatly increased as compared with last year, as was also the attendance, and there is every assurance that the textile exhibition will be a permanent feature of the trade.

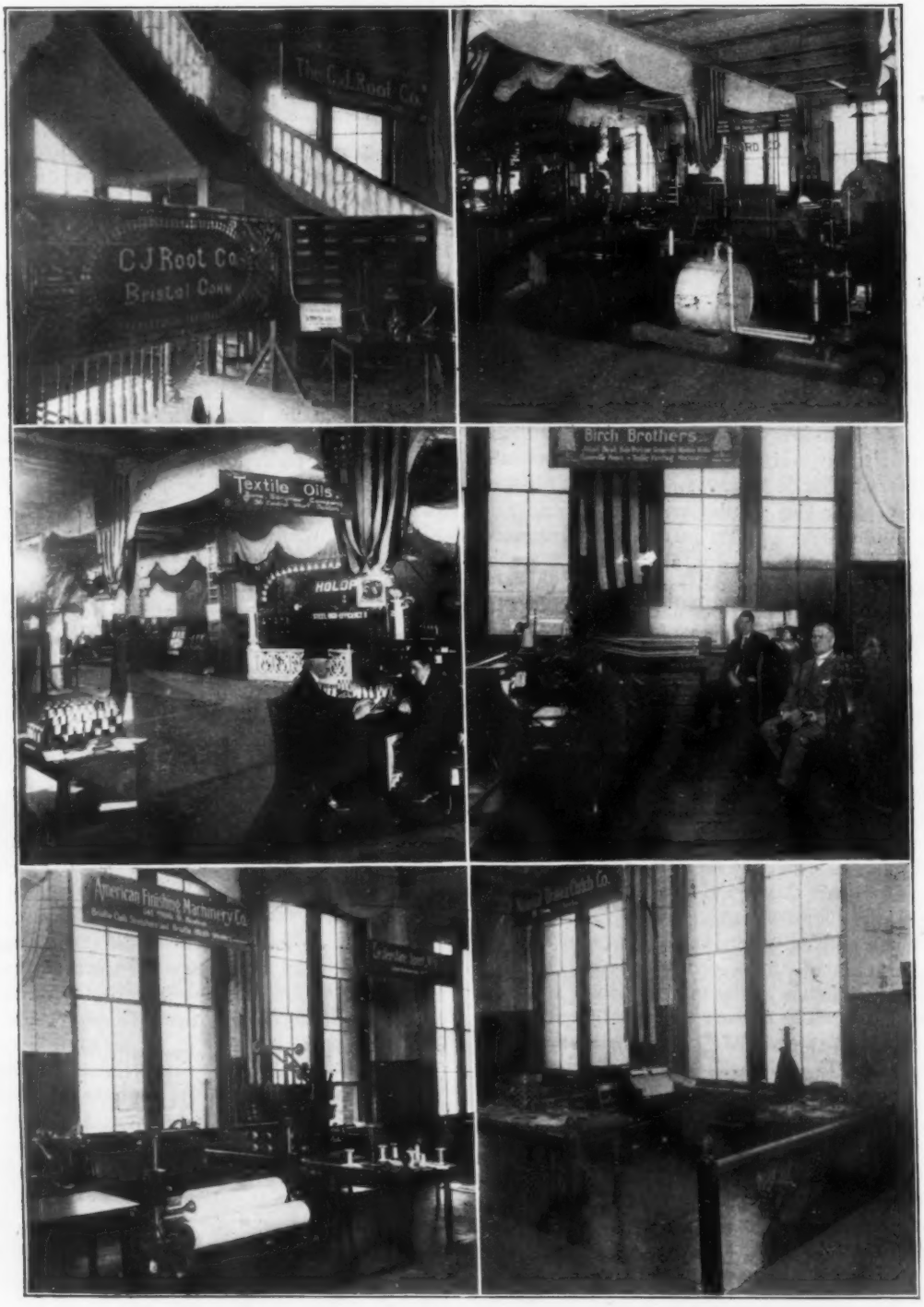
Much credit is due the officers and executive committee of the Textile Exhibitors' Association, President F. H. Bishop, M. H. Merrill, E. F. Hathaway, D. A. Corey and H. W. Butterworth. The secretary and manager, Chester I. Campbell, has had great experience in this kind of work. Last year's exhibition was his first acquaintance with textile manufacturers, and the experience gained then showed in the improvement this year in every way.

The general attendance was good and the character of the visitors showed that the higher officials of the industry took an active interest in the show.

The combining of the cotton manufacturers' meeting with the exhibition worked to the advantage of both. It resulted in an increased attendance at the sessions of the association and also gave those who came for the special purpose of attending the meeting an opportunity of inspecting the exhibits. The pictures and description of the exhibits give a comprehensive idea of the extent and variety of the show.

The Draper Company, Hopedale, Mass., had a large, well located, interesting and well-planned exhibit in spaces 30, 31, 42 and 43. In coming down the main aisle, the visitor saw in operation four Northrop looms on various grades of cotton fabrics. The first to demand attention was an L model, 90-inch broad sheeting loom weaving heavy sheeting and using 22s warp and 21s filling, 68 threads and 72 picks. The other three were E model looms, one weaving a fine lawn with 80s warp and 120s cop filling, 88 sley and 92 picks; one weaving pillow tubing with 28s warp and 36s filling, 128 sley and 152 picks for the double cloth; and the last weaving a sateen, 64 sley and 130 picks, 28s warp and 36s filling. The loom on pillow tubing was equipped with steel harnesses and stop-motion.

The Draper Company also showed their models F, G and I warpers; the model F on fine work, the G model with balling machine attachment, and I model with extra large beam. They also displayed the I model spooler and a specially built twister, showing wet twisting on one side and dry twisting on the other. This twister was equipped with the T. H. Smith twister stop-motion, a simple device suitable for dry twisting where a single line of rolls is used, and of especial value on worsted on account of the high value of waste saved. It is interesting to note that the Washington Mills have ordered over 20,000 of them at different periods. A novelty that attracted much attention and exhibited for the first time was the MacColl spooler guide, the invention of the son of ex-president J. R. MacColl of the Cotton Manufacturers' Association. This device removes slubs or bunches which would pass through other devices or guides. It allows small piecings and knots which are unobjectionable to pass through, but will pluck loose slubs and imperfections from the yarn without breaking, holding the slubs in the teeth until they are cleaned. It is easily set, cleaned and adjusted and as it works with a larger opening than other devices, requires less attention. The device is



C. J. ROOT CO.
BORNE SCRYMSER COMPANY
AMERICAN FINISHING MACHINERY CO.

S. F. BOWSER & CO.
BIRCH BROS., SOMERVILLE MACHINE WORKS
NATIONAL BRAKE & CLUTCH CO.

equally well adapted to worsted yarns. Completing their display, was the ingenious automatic yarn tester for testing single yarns and recording automatically, on a chart, the breaking strength in ounces. There was always a crowd around their railings.

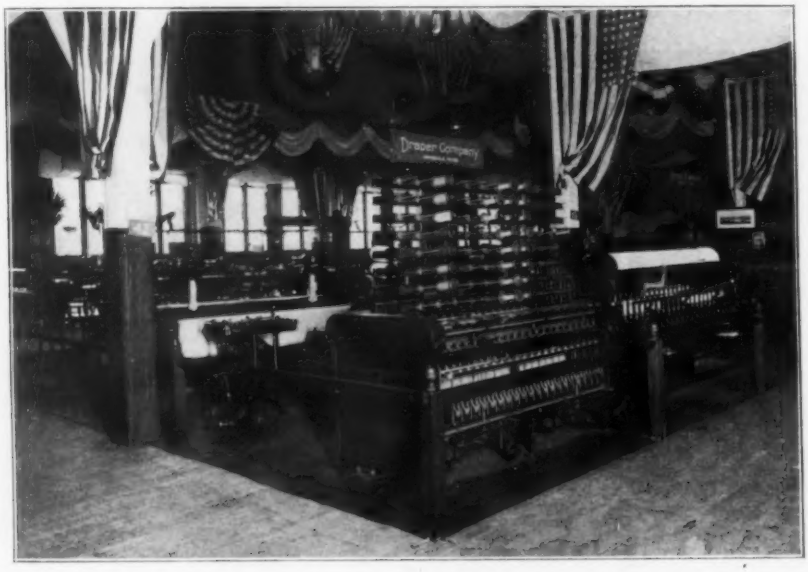
Stuart W. Cramer, Charlotte, Providence and Atlanta, had a large display illustrative of the Cramer system of air conditioning, including Cramer Air Conditioners, individual type, Cramer Spray Humidifiers and Cramer Automatic Regulators for humidifying and heating systems. The Cramer Automatic Regulator was invented to regulate automatically humidity and temperature and to do this on a basis of regain, so that stock goes through the different processes of manufacture without changing its physical condition. It is a simple and durable instrument for mounting on a column in each room in a mill with small air pipes leading to shut-off valves in the water and steam heating systems, thereby controlling the conditions in each room separately and independently of the others. It was shown in both the electrical and mechanical types, the former of the highest sensibility and accuracy and the latter for work where less exacting conditions exist. It can be attached to old existing humidifying and heating systems, as well as to the Cramer system and there is nothing to be discarded and thrown away. The features of the Cramer Air Conditioner are all sheet metal work of seamless drawn copper; no split casings to work loose and get out of order; the nozzle has no adjustable parts; the strainer cocks have reversible wash positions and the conditioner can be cleaned by merely raising and lowering casings. The Cramer Spray Humidifiers require only water pressure for operation.

MOSSBERG WRENCH CO.

At the foot of the steps leading to the Convention Hall and extending along the Huntington Ave. side of the main floor, The Stafford Company set up seven of their automatic looms. The space was enclosed with a mission railing curtained with dark green burlap, the same scheme being carried out in panel effect on the walls. Potted plants on mission-wood stands and the national colors draped above added to this unusually pleasing effect.

Beginning at the steps, their display was as follows: Four-harness pick finding

loom, weaving four-harness blue denim; a new tube motion loom, making pillow tubing, and suitable for other seamless goods; a loom on 40-inch lawn, weaving 75s warp and 75s filling, but which will weave any number up to 100s; a broad 90-inch sheeting loom showing the adaptability of the Stafford automatic principle to wide looms; a three-harness twill loom with pick finding motion; a 40-inch print or sheeting loom, and a twenty-harness dobby loom, weaving cotton dress goods. All of the looms were equipped with warp stop motion and automatic filling changing device. It would be difficult to imagine a more complete demonstration of the uses of the Stafford automatic loom. No exhibit received a larger share of attention from visitors.



THE DRAPER CO.

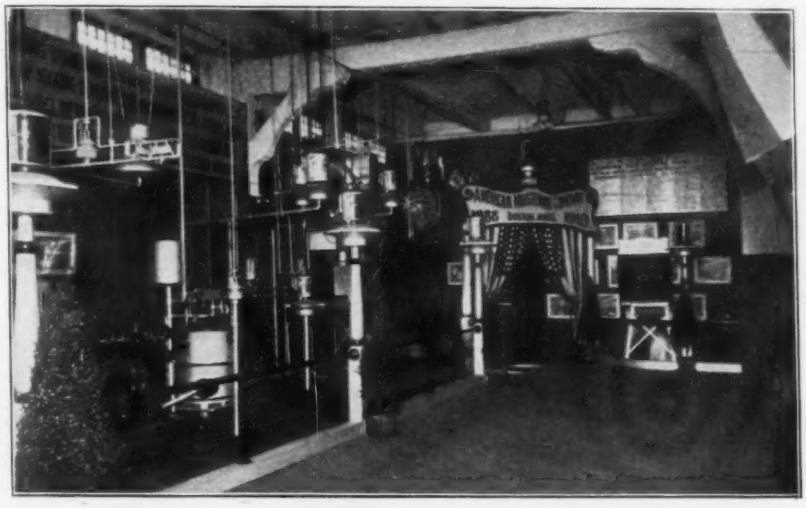
The Mossberg Wrench Co., Central Falls, R. I., makers of textile specialties, special machinery and warp stop equipment, showed a number of their products. At one end of the space a Whitin loom equipped with the K-A electrical stop motion was in operation on a lawn. The stop motion was a 25 grain wire and the warp number 62 cotton yarn. In a day's run of 10 hours only three warp threads were broken. It might be mentioned that the filling was wound from cops on bobbins by the Universal Winder and ran 33 minutes without changing shuttles. At the other end of the space a sixteen carrier International Braiding Machine was covering copper wire with 4/40s cotton yarn. This machine has a range from 1/32 inch shoe laces to 5/8 inch clothes lines and, it is claimed, can be operated at exceptionally high speed and saves 10 per cent. of the yarn. It was one of the features of the show and is illustrated and fully described in the New Machinery Department of this issue. They also showed the Sim-pull and Sim-plex countershafts and belt shifters and the Right-in-Sight Note Book Holder for office use.

An interesting display of finished products and materials in process was furnished by the J. B. Ford Company, Wyandotte, Mich. Samples of their products, Wyandotte Textile Soda and Wyandotte Concentrated Caustic Ash were also shown. The finished cloths and textile materials were from rep-

resentative mills and illustrated classes of goods prepared and finished with Wyandotte products. The display included woolens, worsteds, cottons, crash towels, carpet yarns, prepared wools, rugs and mercerized yarns.

C. G. Sargent's Sons Corp., Graniteville, Mass., featured in their exhibit the Amoskeag Yarn Conditioner, devised by H. F. Straw of the Amoskeag Mfg. Co., which conditions yarns for weaving and knitting. This machine, which was illustrated in the last issue of this magazine, conditions yarns in a manner which overcomes the defects in the old-fashioned systems and accomplishes the desired end in a fraction of the time formerly required and at a decreased cost. The amount of moisture absorbed can positively be controlled by the regulation of the steam and water, also by the speed of the apron. The exposure is about thirty seconds. We understand that a number of orders were placed for this machine at the show. They also showed an automatic feed for raw stock used on cotton waste dusters and cotton dryers.

Birch Brothers, Somerville Machine Works, Somerville, Mass., makers of dyeing and finishing machinery, showed their Angular Guides for taking out crimps and doubled edges and guiding centrally. The feature of this exhibit was three types of sewing machines: The "Coronation" Sewing Machine for piece ends giving three lengths of stitches and using Birch Brothers' invented Hook, making it impossible for sewing thread to get caught. This machine sews any fabric, wet or dry. It is mounted on either English or American style of stand.



THE AMERICAN MOISTENING CO.

The Excel Sewing Machine for piece ends, which uses the usual revolving loopers and the Grey Room Sewing Machine for sewing and trimming with marking and numbering attachment were also exhibited.

The G. M. Parks Co., Fitchburg, Mass., had a model installation of Turbo-Humidifiers. Air was supplied by an Ingersoll-Rand air-compressor. Two different types of installations were shown; one for ordinary mill construction, where the piping is run overhead and the other for saw-tooth weave shed construction. They also showed the compressed air cleaning system usually furnished with Turbo-Humidifier installations. The G. M. Parks Co. has been in the piping business for nearly forty years and took up the sale of the Turbo-Humidifier

about two years ago. Today there are 6,000 Turbo-Humidifiers either in actual use or ordered. They are now supplying equipments with the Carrier Automatic regulation and control which was shown in operation.

The Cell Drier Machine Co., Taunton, operated a 30-cell drier, taking up less than 12 feet of floor space. They stated that this machine is equal to 60 23-inch diameter drying cylinders and effects a saving of 58 feet against the cylinders. They also showed a unit illustrating how the drier can be built up to any size on the principle of sectional book-cases. The cell drier was driven by a small motor through a Reeves variable speed transmission. An interesting feature of this exhibit was the display of photographs of actual installations of cell driers for woolen and rubber, as well as cotton, finishing. A porcelain jig roll, manufactured by Samuel Walter & Sons of Radcliffe, Eng., to take the place of rubber-covered roll, was displayed. These rolls have been very successfully used in Europe and give promise of equal success in this country, owing to the high price of rubber. Orders were taken for cell driers, a Reeves transmission and a number of porcelain jig rolls.

The American Warp Drawing Machine Co., Boston, occupied the spaces 22, 23 and 24 as in the Textile Exhibition of a year ago. They showed in operation a special machine to handle a large variety of work which, at the close of the exhibition, was shipped direct to the Edwards Mfg. Co. of Augusta, Me. A 2-harness warp drawing machine which was sold to the Crown Cotton Mills of Dalton, Ga., and an Axminster carpet tubing machine, sold to McCleary, Wallin & Crouse, Inc., of Amsterdam, N. Y., completed the exhibit.

American Moistening Co. A striking feature of the exhibition was the installation by the American Moistening Co., showing the many types of humidifying and air washing apparatus of this well known corporation. They included six forms of Comins' sectional humidifier and other apparatus as follows: 1, Sectional humidifier with the center pipe; 2, with a double outlet; 3, single outlet with elbow; 4, single outlet with trunk conditioning room apparatus; 5, single cylinder fan type; 6, double cylinder fan; 7, Comins' centrifugal humidifier; 8, 5 jet atomizing humidifier; 9, Garland atomizing humidifier; 10, improved atomizing in three forms; 11, air washing and humidifying apparatus; 12, air cleaning apparatus with two types of nozzles; 13, aerophor fabric dampener; 14, sprayer for mines; 15, improved hygrometer.

The visitors were able to see these various devices in operation, but that which clinched the argument was an illuminated panorama of testimonials from 800 users of the American Moistening Co.'s humidifying apparatus. The name of each mill and the testimonial as to the successful use of the humidifiers were exhibited long enough to be read carefully, and then made way for another satisfied user until the circle of 800 names had been completed. The entire exhibit was a convincing argument.

The Carrier Air Conditioning Company. The complete installation of the Carrier air washer and humidifier was located in the center of the hall in charge of J. I. Lyle and E. T. Lyle. Besides the air washing and humidifying apparatus there was a complete line of automatic temperature and humidity controlling devices. The visitors learned by reading the thermometer that the air passing through the humidifier was cooled from 10° to 12°. The dampers and valves regulating the air supply were automatically controlled, the operation of the controlling device being easily seen. There was one automatic humidity controlling attachment on exhibition adapted for any head type of humidifier. The Carrier automatic control is very simple, requiring but little attention, with no delicate parts to give out and is very sensitive. It depends upon the expansion of materials and does not involve the use of any electric device.

The Universal Winding Co. This company exhibited two forms of their new No. 90 quilling machine, one showing the attach-

ment to wind direct from skeins to bobbins. This attracted much attention, it being the first machine ever placed on the market to handle yarn from skeins at a spindle speed of 2,000 revolutions per minute. The mechanism for controlling the operation of the swift is entirely new and has been covered by patents in this country and abroad. This skein winding attachment makes the quilling machine practically invaluable to all mills using yarn dyed in the skein. The No. 90 machine was also shown winding direct from mule cops and frame bobbins and was in operation on practical lines winding filling for use in the different looms exhibited in other sections. As illustrating the fact that the word "Universal" applies to a system of winding and not to a machine, the Universal Winding Company displayed a very large and varied assortment of samples of winding. These extended from large packages of rope containing 75 pounds down to the finest single Canton silk averaging about 250,000 yards to the pound. In each and every example of winding between these extremes, there is the same exact uniformity that characterizes this system of winding.

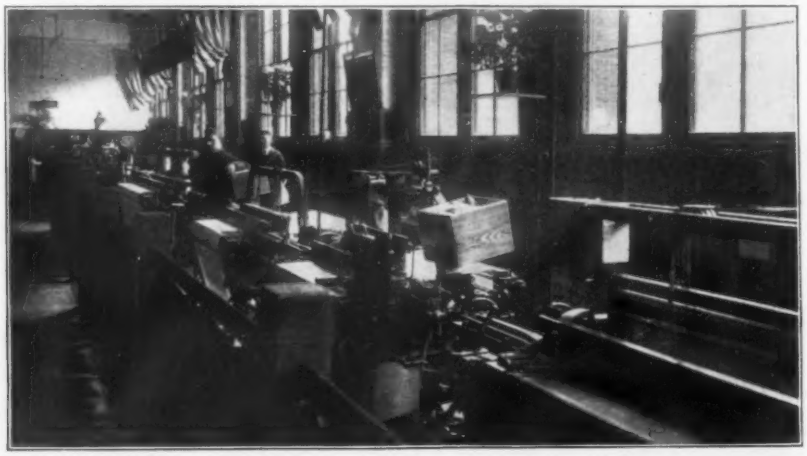
The Universal No. 50 machine fitted for winding Nutaper cones attracted a lot of attention, especially among spinners of soft yarns for knitting purposes. Although the exhibit was not made for the purpose of soliciting trade, but rather as a demonstration, the Universal Winding Company report very large sales of these machines coming from yarn and cloth manufacturers as voluntary orders after an examination of the merits of the exhibit.

STUART W. CRAMER'S EXHIBIT.

Thos. Leyland & Co., Boston, had an exhibit of finishing machinery, including scutcher with solid brass scroll, the worm and scroll being combined, all bearings self-setting and interchangeable; a stretching machine on dry cans for wide goods such as sheetings, quilts, etc., stretcher to get excessive widths on water mangle; calender

stretcher; pneumatic beetler, piece end sewing machine and whale back sewing machine.

The wide stretcher or expander for quilts, etc., attracted a good deal of attention from manufacturers who were interested in observing the rigidity of the machine. The pneumatic beetler was of special interest to those who are familiar with methods employed in England, where this finish is more largely used on ginghams and similar goods than in this country. Mr. Walsh, the manager of Thomas Leyland & Co., believes that tests with this particular type of beetler, which is more economical than others hitherto used, may demonstrate the fact that mills desiring the advantage of a beetle finish can obtain it with little if any added expense.



THE STAFFORD CO.

The Little Giant Hydraulic Machine was exhibited by J. M. Gamewell, of Spartanburg, S. C., who is the inventor. This is a press machine, hydraulic engine jack and shaft straightener all in one and is used for forcing gears and pulleys on shafts and off again, forcing bushings, straightening shafting, etc. This machine occupies only 2 by 4 feet floor space and has a guaranteed pressure of 16,000 lbs. It was fully described and illustrated in our last issue.

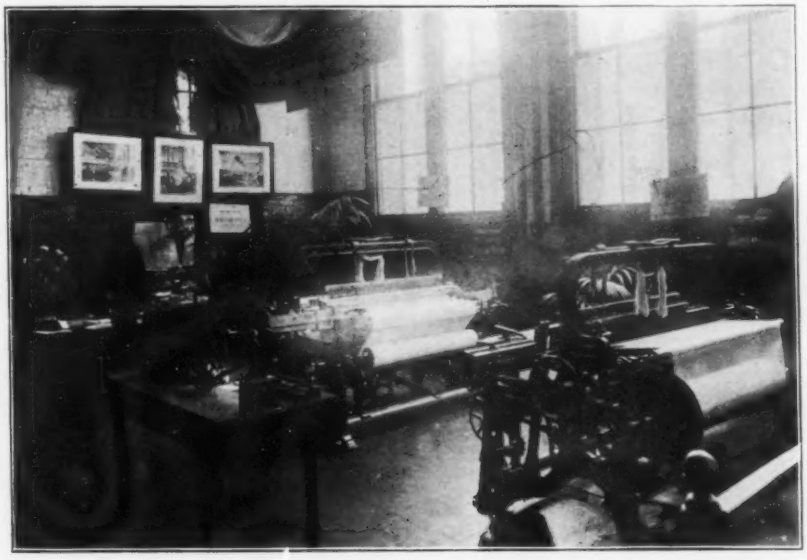
Henry L. Scott & Co. displayed effectively their specialties, which show the high degree of efficiency to which the development of mechanical apparatus for the testing of yarns and fabrics has been brought. Their display included English style yarn testers, a cloth tester with 1-inch jaws and a capacity of 200 lbs., and their yarn tester with automatic power attachment, facilitating rapid handling of tests and insuring accuracy. In addition, they showed a yarn inspector which allowed every inch of yarn to be closely inspected; a roving reel with 36-inch cylinder, and two twist counters for determining the turns of twist in yarn.

Crocker-Wheeler Co., Ampere, N. J., had a very practical display, showing one of their 20 h. p. induction motors with a prony brake test. This is the Crocker-Wheeler type of motor that is especially adapted for use in the textile industry. They also had a fine line of photographs illustrating various installations in mills and municipal plants.

The Keystone Lubricating Co. gave in their exhibit a practical demonstration of the uses of Keystone grease on the various parts of an engine and a line shaft, having a small engine and shaft in operation. They showed the use of their special grease cups

and the application of their different greases to cylinder boxes with cards and various bearings on spring forms, mules, etc.

Lestershire Spool Mfg. Co., Lestershire, N. Y. The feature of this display was the firm's new metal-protected, wooden spools, having heads of regular two-ply construction. The metal disks which on a four-inch diameter head weigh about one ounce per spool, are so applied as to extend into the barrel and prevent the metal from ever bulging out into the traverse. The outer rim of the metal is then swaged over the head and crimped into the wood so the plies of the head cannot loosen or come apart. The exhibit also included cotton, woolen and worsted filling bobbins, warp bobbins with metal caps and shields, dogwood twisters with useful devices, and caps, dogwood lace spools, slubbers and speeder bobbins, plain, wired and metal shields, linen, wet and dry, solid maple spinning bobbins, wire spools and braider bobbins.



AMERICAN TEXTILE APPLIANCES CO.

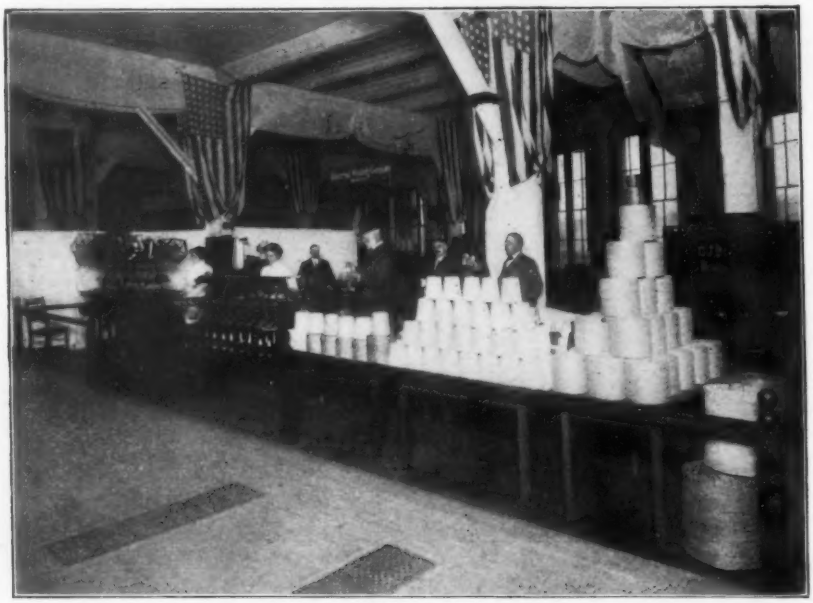
William Sellers & Co., Inc., of Philadelphia, showed the practical application of various drives by means of belts and ropes that conform to everyday practice in cotton mills, or in any mill or factory where power is distributed by mechanical drive. They manufacture all of the appurtenances that are used in Power Transmission Machinery Equipment. Strongly advocating Cast Iron Bearings instead of the Babbit Lined, they show one bearing that has been in continuous service nearly sixty years; the bearing surface remaining in perfect condition. Their Binders, Frames, Guide Pulleys and various forms of Carriers attracted a great deal of attention and favorable comment.

American Textile Appliances Company. The exhibit of this company included both mechanical and electrical warp stop motions in operation on two looms. One loom was equipped with the Baker mechanical stop motion. This motion has many points of advantage, including simple construction, durability, freedom from lint, and ability to place the motion well forward above the crank, as all the parts are above the warp. It is equally effective with the lightest as

well as the heaviest drop wires, both of which are accommodated without change of parts. The electrical stop motion included an indicating drop wire which is one of the special features of this motion. It indicates instantly to the weaver which thread is broken, thus saving time in tying-in and getting the loom started again. The motion includes very few parts and is adapted for a wide range of work. A very weak electric current is used and the drop wires can be put on the warp threads with the loom running. It is suited for worsted and silk as well as cotton goods, there being a large number now in use on worsted looms.

The Woonsocket Machine & Press Co. Probably the largest machine on exhibition was the roving frame of the Woonsocket Machine & Press Company, which was running with 168 spindles, 7-inch traverse and 3 1/2-inch bobbin. This frame was 40 feet long, 3 feet wide and 6 feet high. The work was 8 hank roving from carded American cotton with a draft of 7 1/2. The visitors were especially attracted by the one-inch belt with which the frame was driven, the spindles running 1300 revolutions per minute. The frame was equipped with ball bearing top rolls. Over one million spindles on frames of different makes are now equipped with this type of top roll. The exhibit was in charge of A. L. Willey, who was kept busy answering questions from interested visitors.

H. W. Butterworth Sons Co., Philadelphia, manufacturers of bleaching, dyeing, drying and finishing machinery for textile fabrics, decorated their space with cut flowers and bunting, making it a most attractive stopping place. Cuts of their machinery were displayed.



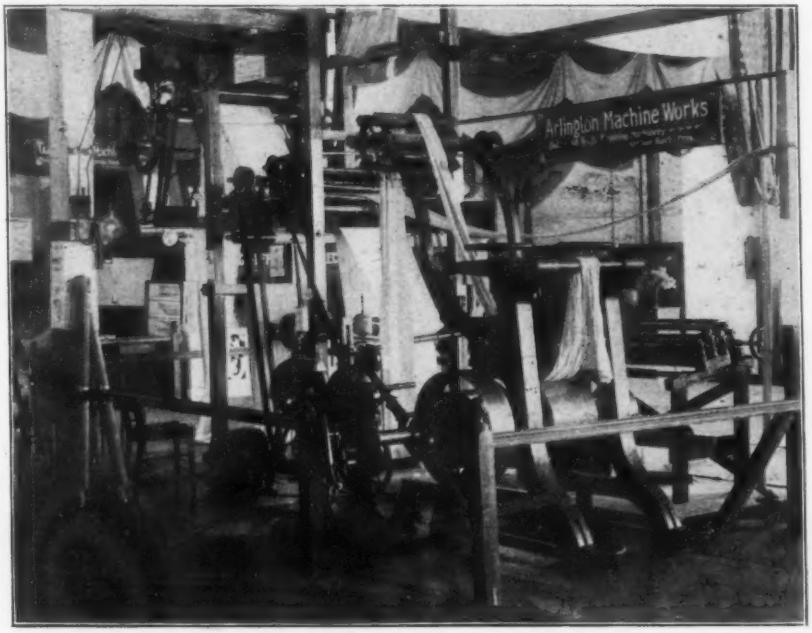
THE UNIVERSAL WINDING CO.

The Barber-Colman Co., of Rockford, Ill., exhibited three models of warp tying machines, including the Model E, which has been on the market for a number of years, and Models H and J, which are recent additions of less capacity than Model E. These two latter models are particularly adapted to smaller mills. They also showed three sizes of the Barber knotter, A, B and C. This company has just brought out a new

device known as a traveler placer which is fitted with a magazine for holding ring traveler. The traveler is placed on the spinning ring by this device, which delivers and places the traveler by the simple operation of a lever, saving time and the scattering of travelers on the spinning-room floor.

The Cling-Surface Co. had an apparatus for testing power transmitted by two belts from the same roll of leather; one running tight, but untreated, and the other running slack, but treated with Cling-Surface. The device consisted of a frame with movable carriage and four dials, showing belt tension and brake load. It was demonstrated that a belt treated with Cling-Surface will carry a far greater load at a slack tension than an untreated belt at tight tension. The advantages of this, of course, are not confined to the prevention of slipping, but also to the saving in wear and tear caused by tight belt and the greater amount of power consumed in driving where the belt is excessively tight.

Holophane Co., Newark, O. Although on the market for nearly a year, this is the first time that the Holophane Steel Reflector has been exhibited. They demonstrated in a very convincing way that the Holophane Steel Reflector makes any light on which it is used practically 50 per cent. more efficient than it would be if an ordinary metal reflector were used. The Holophane Company is the largest manufacturer of scientific reflectors in the world and has spent several thousand dollars in perfecting a reflector to meet the special needs of the textile field. The reflecting surface of the Holophane Reflector is practically indestructible, as the substance is applied when the metal is in a porous condition. Most of the exhibits were supplied with these reflectors, which gave a very practical demonstration of their value. The operatives and exhibitors were greatly pleased. Mr. Scantlebury, in charge of the textile sales branch of their business, read an interesting paper at the meeting.

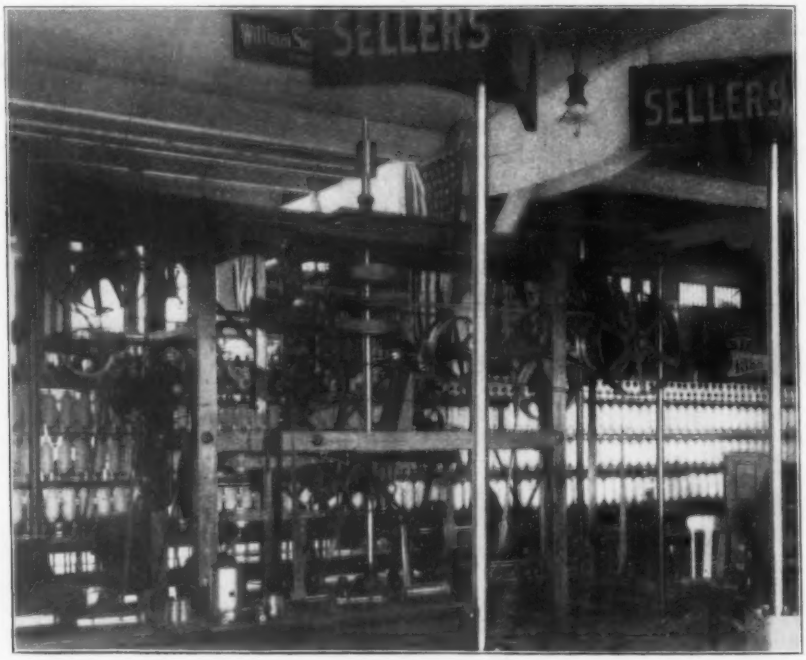


ARLINGTON MACHINE WORKS, ARTHUR BIRCH.

Borne, Scrymser Company, the old established refiners of oil, exhibited on the main floor a complete display of Textile Oils, of which they make a specialty, as well as all grades of Lubricating Oils. For the woolen

interests, the well-known brands of the Breton Oils for wool, which have been on the market for over twenty-five years, were

John W. Fries of New York occupied Space 11 and demonstrated the simplicity of installation and operation of the Hygrosso

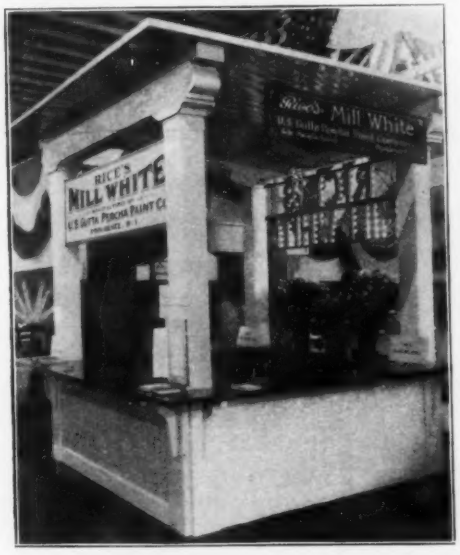


WILLIAM SELLERS & CO.

on view, with capable woolen men to explain and discuss the value and wisdom of choosing the special oil according to the particular work to be done. This exhibit included the regular Breton Oil, used in place of lard; Saponified oil for wool—Breton Brand, which is fast replacing Red Oil; and olive oil for wool—Breton Brand. which is meeting all the requirements of olive oil. They had a spindle oil for every class of spindle—Rabbeth-Mule—woolen, etc., and for the mill that was partial to light colored products, such an oil could be furnished by them. On lubricating oils, cylinder, engine, machine, etc., their well-known products were shown. A most satisfying line of greases for all purposes completed an exhibition that showed the wide and exceptional facilities Borne Scrymser Co. have for caring for every lubrication problem that meets a mill man.

THE J. B. FORD CO.

Humidifier. He showed a belt driven and a motor driven humidifier, and the automatic control which controls each humidifier as a

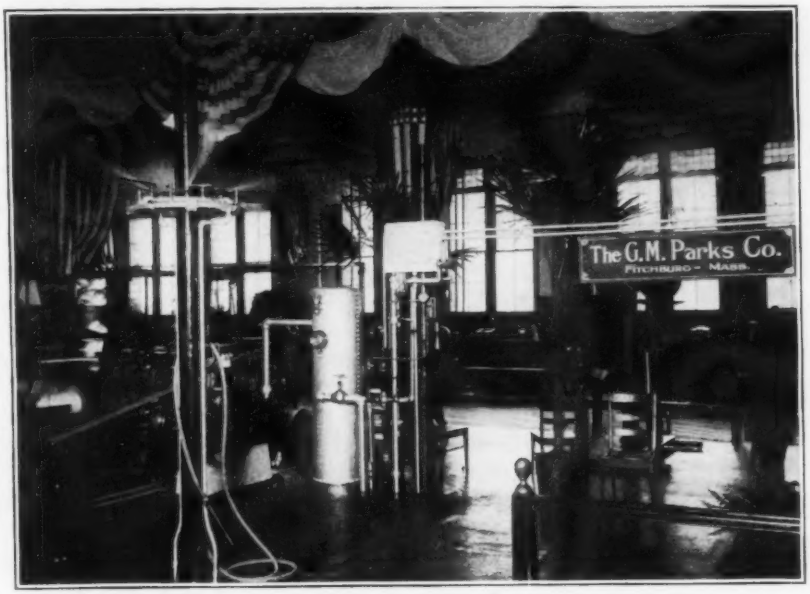


U. S. GUTTA PERCHA PAINT CO.

unit. This humidifier is of the spray type and, it is claimed, is the simplest made. No water, steam pressure or pump is required in its operation and it requires only 1/8 h. p. per head. The atmosphere around this exhibit was always cool and refreshing.

S. F. Bowser & Co., Inc., Fort Wayne, Ind., featured their self-measuring oil and gasolene pumps and tanks in large variety. To those who use only the old system of handling oils, this exhibit was an education in oil storage and distribution. The new Bowser Automatic Registering Measure for oil and similar liquids was on exhibition. A large cotton mill in Maine is to install this apparatus for pumping machinery oil from tank car to storage tank in the factory, and measuring the quantity. A large carpet manufacturing concern has already installed it for pumping wool emulsions from tank to place of use.

The Link-Belt Company, Boston, showed a demonstrating set of gears and high speed chains, showing the "Maximum" Silent Chain operating quietly at high speed. Owing to the peculiar grip of the teeth on the links this makes an efficient and absolutely positive drive, insuring satisfactory operation on the classes of machines on which it is used. The links are free from any binding action and the absence of friction means full power as well as safety in transmitting it.



THE G. M. PARKS CO

In one corner of the exhibition hall Mrs. J. N. Jackson gave a demonstration of old-time carding and spinning, which delighted many of the visitors. There was a picturesque display of old spinning wheels and reels and Mrs. Jackson showed great skill in their operation.

The Thissell Co., Lowell, Mass., exhibited for the first time an automatic loom which they will manufacture and numerous loom attachments. The loom is of the automatic shuttle-changing type with warp stop motion, weaving Canton flannel. It is equipped with a harness loosener, giving easy access when necessary to draw in threads; also what is called a cloth inspector, which stops the loom on misspicks or other defective places. This loom is of the non-feeler type and has a capacity of twelve shuttles. It attracted much attention as one of the novelties of the show.

The Carbolineum Wood Preserving Co., of New York, showed a convincing array of orders and repeat orders from textile mills who have been using their product for years. They also showed by laboratory tests that Carbolineum Avenarious is absolutely pure, contains no foreign substances, does not make wood more inflammable and that the constituents contained in it will not evaporate, but will remain indefinitely in any timber with which it is treated. Mr. Hartmann, the manager of the company, was in attendance during the week, renewing and extending his acquaintance with mill men.

The American Finishing Machinery Co., of Boston, showed their new bristle cloth stretcher, which gave an opportunity for many who had heard or read of it to see just how it worked and become convinced of its efficiency in stretching cotton fabrics of all weights. The bristle cloth winder was shown for the first time. The cloth is first expanded and stretched by the bristle stretcher and is wound into a firm, solid roll free from wrinkles.

The Colwell Gillard Co., of Fall River, Mass., demonstrated their electrical warp stop motion on a Whitin loom.

The Franklin Process Co., Providence, manufacturers of the Franklin dyeing machine for cotton, wool and worsted yarns in packages or other form, exhibited a wide range of dyed cones, tubes, etc., demonstrating the evenness of the work and the fine feel of the yarn and fabric. One great advantage of this process is that the yarn is not agitated or disturbed and the fibers retain their original state and do not take on any harsh feeling or roughness, but if anything, are more soft and smooth than before. Samples of hosiery were shown to demonstrate this. A special Universal winding machine prepared the yarn for this process.

The Arlington Machine Works, Arlington, Mass., displayed special machinery for bleacheries, dye works and print works. The feature of their exhibit was an opening or scutching machine in operation in conjunction with a folding or plaiting machine. They also showed Hadwin's patent scrimp rail, for which they are exclusive American agents. The special advantage of this scrimp rail is that it does not require any sharpening, as owing to its peculiar construction the teeth are always sharp and in efficient condition as long as the metal lasts. It is reversible, so that when one side is worn down the other can be used. The blades are steel, brass or vulcanized fiber, as may be desired. This scrimp rail is having a large sale in England and Europe, as it is always sharp and there is no necessity of filing to keep it so. They also showed William Birch's patent bell crank lever expander, sewing machines of two different style stands and bleach house squeezer.

C. J. Root Co., Bristol, Conn., had an attractive exhibit of the company's various lineal counters, automatic counters and measuring machines, showing how these machines are put together and how the accuracy of the count is insured. They have been adapted to a wide variety of textile purposes. There was also a fine board display of the company's comprehensive line of hinges.

Allis-Chalmers Co., Milwaukee, Wis., had an exceptionally good exhibit of motors of

various sizes and steam turbines with the inside parts exposed to view. An interesting part of this showing consisted of photographs of the various mill installations.

The National Brake & Clutch Co., Boston, showed in space 94 the extensive application of Cork Inserts in textile manufacturing, among which were noted loom friction rings, slasher frictions, loom brake frictions, winding machine clutches, wood clutch blocks, mill baskets and trucks, including their well-known canvas basket, doffer trucks and platform truck, with the two baskets for shipping roving trucks, bags, spinners, aprons, etc. They reported the closing of some good orders.

The Crompton & Knowles Loom Works occupied Spaces 44 and 45 on one of the main aisles. They operated two automatic gingham looms by individual electric motors,

THE CROMPTON & KNOWLES LOOM WORKS

quiller washers, spooling machine cones and pulleys, rope machine frictions, cones for silk quillers, wood rim iron arm and hub pulleys, wood with iron flange motor pulleys, fiber face motor pulleys, and a new type of steel pulley with double rim box construction, with corks inserted through the outer rim against the inner rim. The advantages of this type of pulley are increased strength, which absolutely prevents the pulleys from getting out of true, and still more important, an increased efficiency of 60 per cent. over the ordinary type of steel pulley. One of the most interesting features in their diversified display was a model showing the application of cork inserts to speeder cones.

W. T. Lane & Bro., Poughkeepsie, N. Y., had a fine exhibit of their complete line of

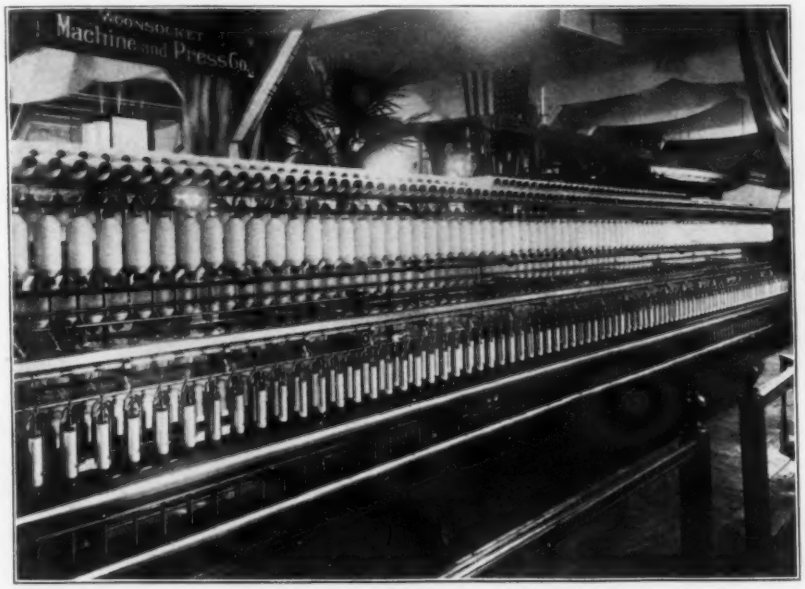
one four by one boxes and the other two by one boxes. The interest of the practical man was held by this exhibition of the results of successful mechanical genius, while the ladies admired the attractive patterns woven. This loom is of the feeler type and selects a bobbin from the magazine of the same color as the bobbin in the shuttle running out. In the four by one box loom, four fillings, white, buff and two shades of blue, were woven. In the two by one box loom, a pink and a white filling were used. The exhibit was typical of the wonderful progress made in depending more on the machine and less on the operative in weaving. Practical mill men found this exhibit one of the most interesting in the show as it dem-

W. T. LANE & BRO.
HOLOPHANE CO.
THE THISSELL CO.

CARBOLINEUM WOOD PRESERVING CO.
L. E. BARNES, AGENT. HATTERSLEY'S NARROW FABRIC LOOM.
LESTERSHIRE SPOOL & BOBBIN CO.

onstrated a long step forward in the development of automatic weaving. This loom was worked out on practical mill work at the York Mills in Saco, Me., where several hundred have been installed with most satisfactory results.

The Lord & Nagle Company, publishers of the Textile World Record, Official American Textile Directory, the American Directory of the Knitting Trade, textile books, etc., occupied a large space on the main floor which was attractively fitted up with desks, tables, comfortable chairs, and decorated with bunting, flowering plants and shrubs. Convenient bookcases were filled with their publications. Many visitors, both subscribers and advertisers, called to shake hands with the different members of the staff that were in attendance and many of the exhibitors found the services of the stenographer and Oliver typewriter of great convenience.



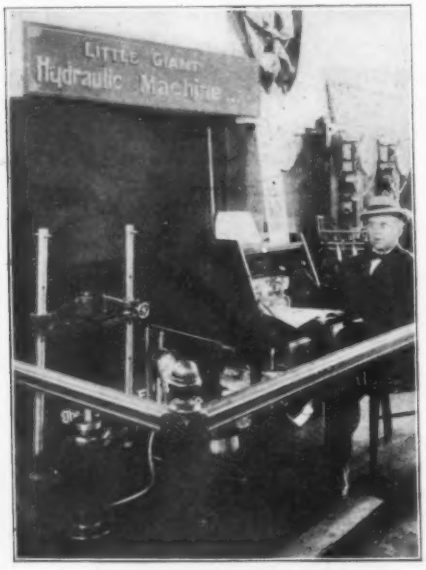
THE WOONSOCKET MACHINE AND PRESS CO.

Macrodi Fiber Co. had an effectively arranged display of fiber head spools in large variety of sizes and styles painted in different colors on a background of green burlap. The fiber used is a special preparation for this purpose and makes a very strong and durable spool that cannot split.

Most of the textile journals occupied spaces. The Textile Manufacturers' Journal had comfortable quarters in the balcony overlooking the main floor. The Textile American and Wool and Cotton Reporter occupied adjoining spaces in the south aisle. Fiber and Fabric had a very interesting and attractive display, showing textile raw materials and the finished product, loaned by some of the prominent cotton mills. The Cotton Publishing Co. had their headquarters in the east aisle.

Wadsworth, Howland & Co., of Boston, had an attractive exhibit in the form of a little house which was painted with this company's products. One of their specialties is a coating which is a fire retarder and has the indorsement of the fire underwriters. It is being used largely in factory work. They

also manufacture a special stain for concrete piers and other concrete work. The advantage is that it prevents cement and stucco



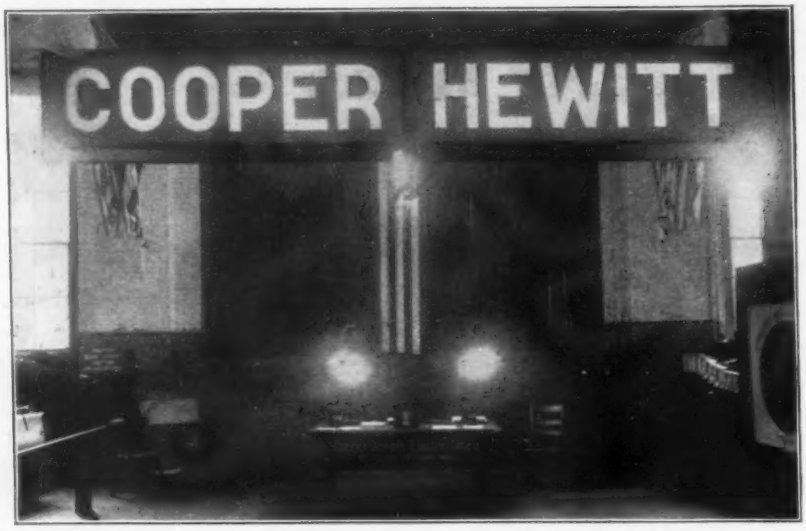
LITTLE GIANT HYDRAULIC MACHINE.

walls from showing dampness after a storm and prevents cracking, as the paint or stain fills the pores and tends to preserve the plaster by keeping out the dampness, while at the same time affording a pleasing finish.

John Hetherington & Sons, Stephen C. Lowe, agent, showed the Nasmith comber working on 1 1/2-inch Peeler cotton. This is the same machine that was shown at Philadelphia three years ago and purchased by the Soule Mills, who loaned it to be shown after three years' mill work.

Cooper-Hewitt Electric Co., New York City. This exhibit of the Cooper-Hewitt Electric Lamps for alternating current, the Type "H" Automatic Tilting Lamp, a Type Double H Lamp, automatic tilting, attracted a great deal of attention owing to the fact that they demonstrated how nearly the light they give approaches that of daylight. An interesting addition to this exhibit was the fine display of photographs, showing the daylight conditions obtained by the Cooper-Hewitt Lamps.

Jenkins Bros., New York, had a complete line of their valves of all sizes and their No. 96 Brand Steam Packing, also the new Jenkins-Donnelly Differential Vacuum System of heating. Their exhibit included the Perkins Concrete Hanger Socket, for which they are agents.



COOPER-HEWITT ELECTRIC CO.

General Vehicle Co. of Boston displayed a large electric motor truck such as are being made for use by mills and which are considered more economical than hauling with horses.

U. S. Truck & Supply Co., Philadelphia, Pa., showed how with the Hercules Self-Loading Truck one man can readily load and convey an 800 or 1000-pound case.

and durable as three of ordinary paint and oil.

L. J. Wing & Co., New York, displayed their Turbine Blower for forced draft. The blower can use the cheapest of coal and is said to greatly increase the capacity of boilers and chimneys.

Phillips Mfg. Co., New York, showed the Phillips Automatic Commutator Grinder for

CARRIER AIR CONDITIONING CO.

Gantt Piling Machine Co. exhibited for the first time what they claimed to be a decidedly revolutionary method in piling cloth in bleaching. The machine has been in use for about five years, requires no power to operate and saves the time and wages of one man, as it allows a bleacher to look out for his bleaching instead of spending time looking after the boys.

U. S. Gutta Percha Paint Co., Providence, R. I., occupied an attractive booth overlooking the main floor. This firm manufactures the now famous Rice's Mill White which has been so extensively advertised in textile papers. Its peculiar light-reflecting qualities make it a great saver of gas and electricity. Two coats of it are as lasting

trueing up all kinds of commutators, etc., also the Mears Velvet Shock Absorber.

W. T. S. Bartlett, Lowell, Mass., had a wall display of Waterproof Paper, tubes, bobbins and spools.

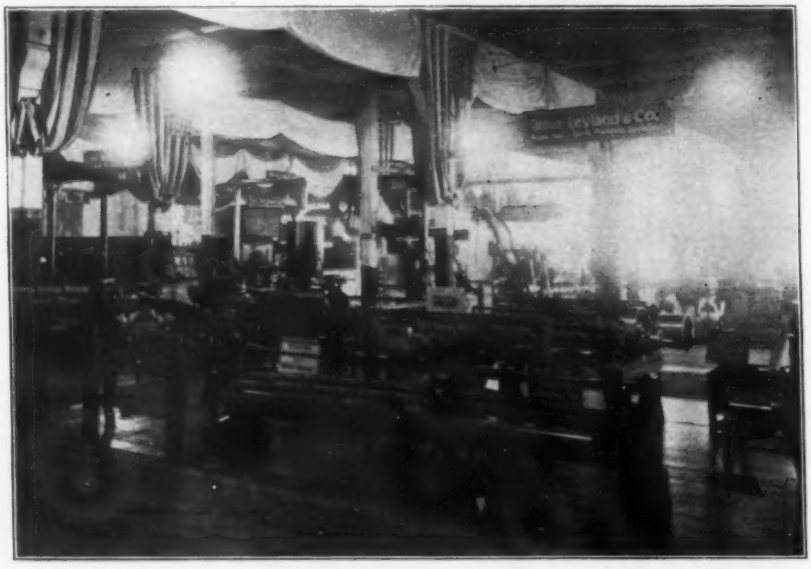
The Sub-Target Gun Co., Boston, showed in their space automatic weighing and recording scales which they are building for the Treasury Department of the United States Government and which will be used for weighing sugar. The recording instruments are built in a steel case. They operated a Holly Circulator used in bleacheries, dye houses, hot water heating plants, or in any place where liquids are circulated.

The West Disinfecting Co., New York and Boston, showed samples of their products which are largely used in textile mills. The increasing attention given to this subject is suggested by the variety of appliances on exhibition.

The Enterprise Rubber Co., Boston, New England agents for the Eureka Fire Hose Co. and Peerless Rubber Mfg. Co., exhibited all rubber goods used in textile mills. Prominent in their display were cotton rubber-lined fire and mill hose.

The White Company, Cleveland, O., manufacturers of automobiles, had on the floor a White gasolene truck of from three to five tons' capacity, especially designed for mill use. This is a four-cylinder machine, cast in bloc.

In Space 87 the Walsh & Houston Sewing Machine Co., Lawrence, Mass., showed two new type mill sewing machines for wet or dry work. One machine is equipped with pulley for belt attachment and the other is of the foot power type.



THOMAS LEVLAND & CO.

The Rhode Island Humidifier and Ventilating Co., Providence, demonstrated the James Kelly system of humidification. The equipment consisted simply of an air compressor, pipe taking water from the city water supply and piping for one head, similar to a gas jet, which sprayed minute particles of water.

A very interesting display which, in a way, gave the exhibition a completeness it otherwise would not have had, was supplied by the American Teaser Cotton Gin. Seed cotton as it comes from the cotton field was shown in the process of ginning.

The Heine Safety Boiler Co. of St. Louis, Mo., exhibited a dissected model of a Heine Safety Water-proof Boiler so arranged that one could readily examine the fire box and tubes of the boiler.

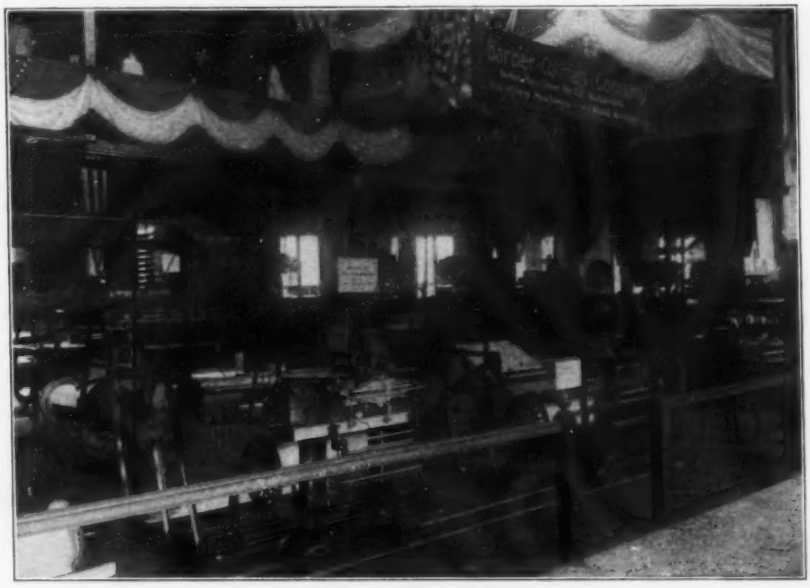
The Harriman Engine Company, Boston, had in operation the Harriman Single Rotor Rotary Steam Engine, and also demonstrated a new threadless pipe union that will stand 1,000 pounds' pressure.

Upstairs on the Convention Hall floor, the following concerns had exhibits:

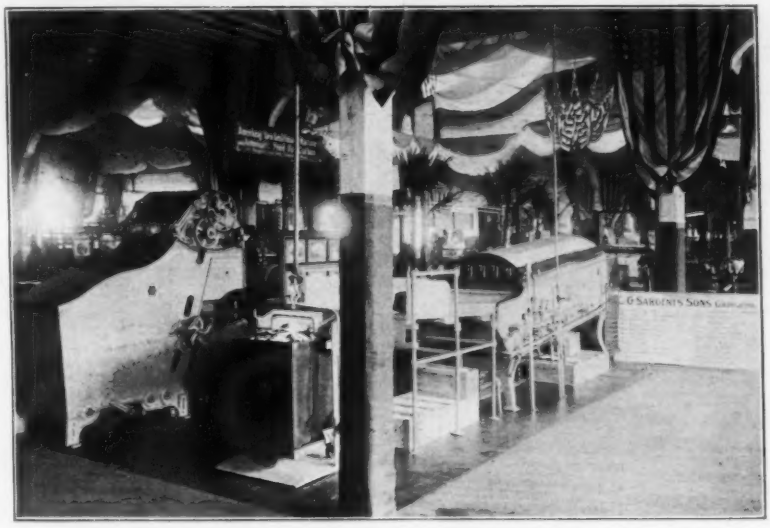
Detroit Graphite Co., Boston, Mass., paint makers.

Wm. Filene's Sons Co., Boston, retailers, exhibited hosiery, gloves and underwear.

The Elliott Addressing Machine Co., Boston.



THE BARBER-COLMAN CO.



C. G. SARGENT'S SONS CORP.

W. D. Badger & Co., Boston, commercial furniture.

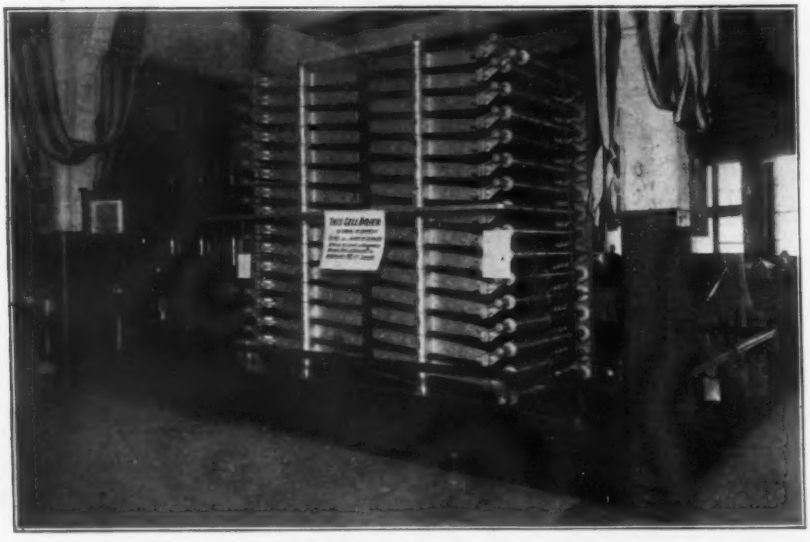
Edward A. Hart, Boston, the Writer-Press.

J. H. Bragdon & Co., New York, The Textile Manufacturers' Journal.

There were also moving pictures of subjects appealing to manufacturers.

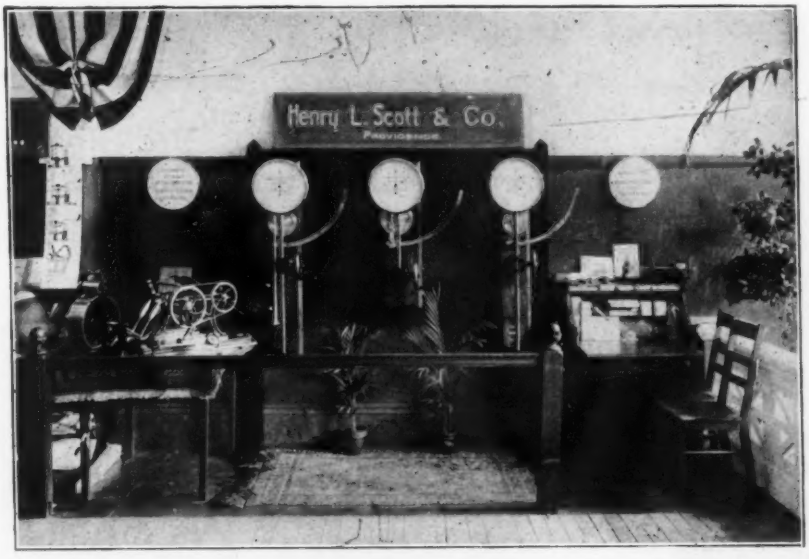
The Basement Displays were of interest to mill men who contemplate the erection of new buildings, as it was devoted almost entirely to cement and concrete construction systems. The Trussed Concrete Steel Works' exhibit was enclosed by a wall of reinforced concrete construction. The Penn Metal Ceiling & Roofing Company displayed a small warehouse of corrugated iron, and gave a demonstration of concrete reinforce-

EXHIBIT OF JOHN W. FRIES. HYGROSSO HUMIDIFIER.



CELL DRIER MACHINE CO.

ment with the use of a triangular mesh. The Edison Portland Cement Company, the all showed different types of concrete construction. H. P. Converse Co., Contractors,



HENRY L. SCOTT & CO.

CLING SURFACE CO. AT THE LEFT, LINK BELT CO. AT THE RIGHT.

New England Sand & Gravel Company, M. E. Smith & Bros., The David Craig Co. and the Atlas Portland Cement Company, Boston, showed the Kahn system of reinforced concrete buildings. C. S. Wert, Kendallville, Ind., displayed his Perfect Brick

Machine. The Peerless Brick Machine Company, Minneapolis, the American Ma-

THE TEXTILE WORLD RECORD. LORD & NAGLE CO.

THE CROCKER-WHEELER CO.

son Safety Tread Company, Boston, and The Pellee Company of Boston, also had exhibits in the basement.

American No-Slip Cement Co., Boston, Mass., had an exhibit of Palium, a scientifically prepared cement designed to give, when applied to pulleys, the exact surface necessary for perfect contact with the pulley.

Correspondence and Notes

UPON TEXTILE TOPICS AT HOME AND ABROAD

NEW STYLES FOR COTTON FABRICS.

BY J. W.

Fig. 1 is a new and effective stripe for cambric shirtings or cotton dress goods. This class of goods is selling well in all colorings. Fig. 2 is the design for Fig. 1. The drafting for the heddles is given at Fig. 3, and the dobby plan at Fig. 4.

The particulars are 40 dents per inch, 32s and 24s Egyptian for warp; 80 picks per

FIG. 1.

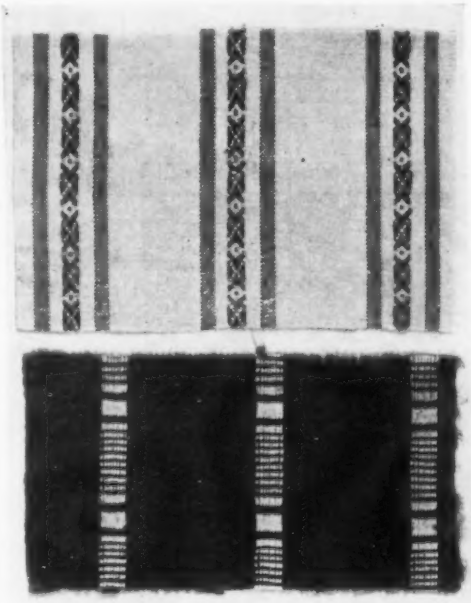


FIG. 5.

inch of 32s for filling. The figuring threads are for the 24s warp, and the remainder 32s warp. On the full design given at Fig. 2 the lines indicate white warp threads, and the heavy squares colored threads. The design can be woven on 6 heddles by a dobby.

Warping pattern:

48 threads white 32s,	24 dents
8 threads navy 32s,	4 dents
8 threads white 32s—	
1 thread navy 24s—	
1 thread white 32s,	4 dents
14 threads, 7 repeats,	4 dents
8 threads white,	4 dents
8 threads navy,	4 dents
96 threads	44 dents

Fig. 5 is a new style of honeycomb stripe, which is a favorite weave at present. In white and colored grounds of various shades this cloth makes up well for blouse cloths and in heavier cloth for vestings. Fig. 6 is the full design for this cloth, by repeating as shown. The crosses indicate the white warp threads, and the solid squares, the color. The drafting for the heddles is given at Fig. 7. Fig. 8 is the dobby plan. This cloth can be woven on 14 heddles by a dobby.

The particulars for manufacture are: 30 dents per inch, 24s American and 2/40s American warp; 56 picks per inch of 18s for the filling. The white threads are 2/40s warp, and the colored 24s warp.

Warping pattern:

48 threads navy 24s,	24 dents
1 thread navy 24s—	
2 threads white 2/40s—	
21 threads, 7 repeats,	6 dents
72 threads	30 dents

This style is also very effective in all white and cream color.

Fig. 9 is a cheap cotton cloth suitable for blouse cloths. This style of goods will be very much in demand during the coming summer. Fig. 10 is the full design. The drafting for the heddles is also given at Fig. 11. The heavy squares denote colored threads, and crosses, white threads. Fig. 12 is the dobby pattern for seven harness.

The particulars for this cloth are: 40 dents per inch, 1 and 2 threads in a dent,

FIG. 2.

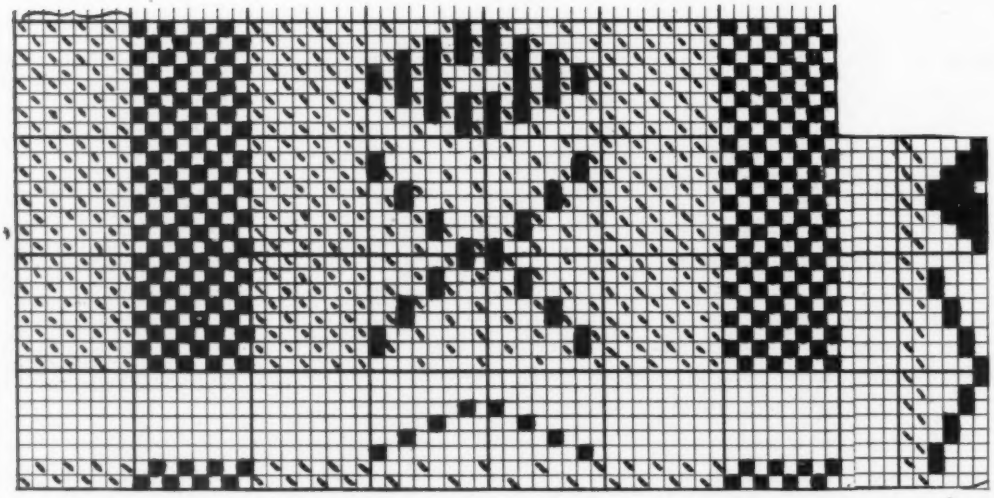


FIG. 3

FIG. 4.

FIG. 6.

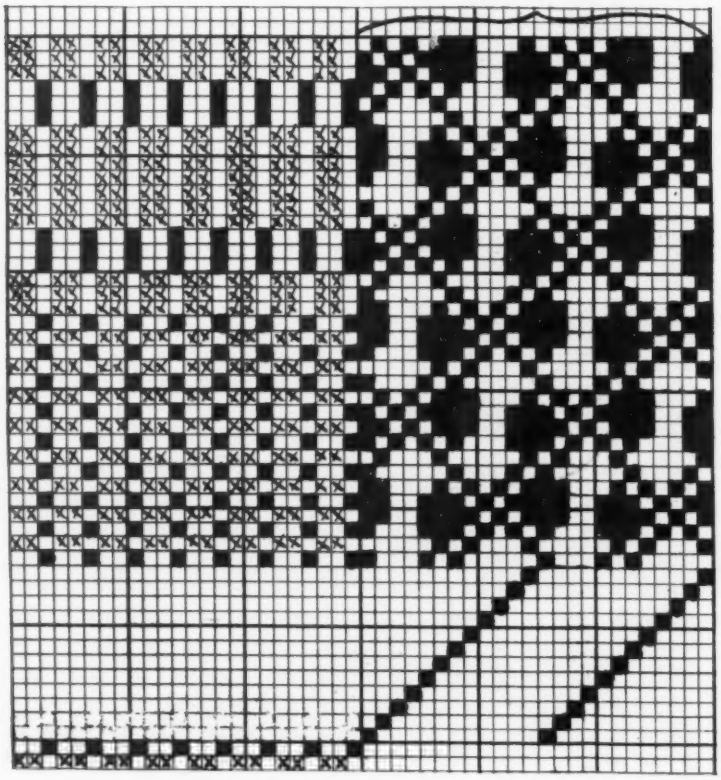


FIG. 7.

24s American and 2/40s mercerized warp, 44 picks of 16s for the filling.

After weaving, a slight nap is raised on the back to give the cloth a better feel.

Warping and denting pattern:

13 threads bright blue,	13 dents

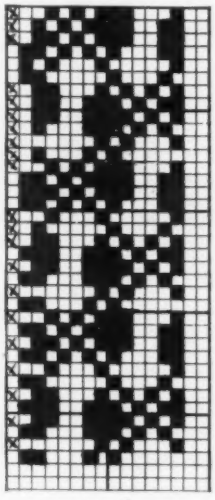


FIG. 8.

12 threads black mercerized,	6 dents
4 threads bright blue,	4 dents
12 threads black mercerized,	6 dents
13 threads bright blue,	13 dents
2 threads black,	2 dents
2 threads white,	1 dent
2 threads black.	2 dents

FIG. 10.

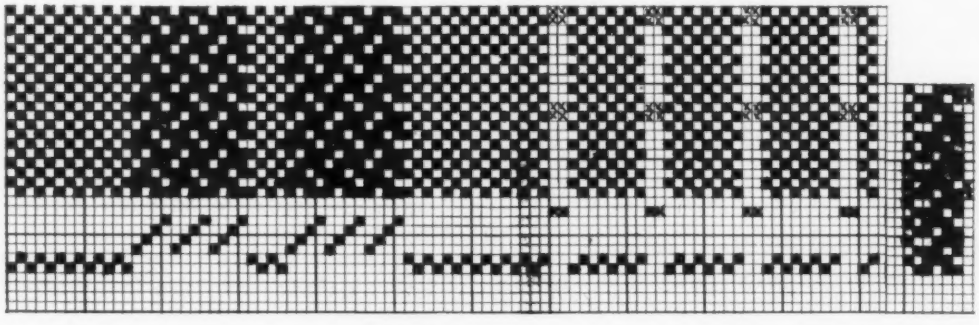


FIG. 11.

4 threads light green,	4 dents
2 threads black,	2 dents
2 threads white,	1 dent
2 threads black,	2 dents
4 threads dark green,	4 dents
2 threads black,	2 dents
2 threads white,	1 dent
2 threads black,	2 dents
4 threads light green,	4 dents

FIG. 9.

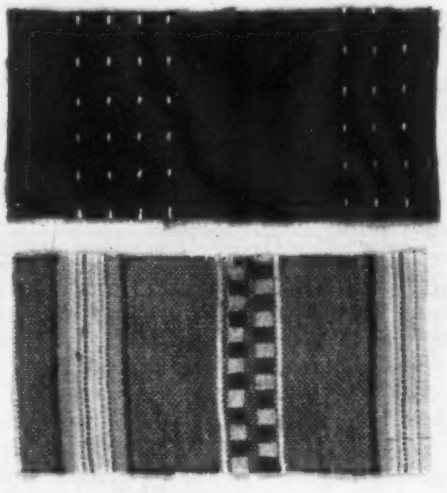


FIG. 13.

2 threads black,	2 dents
2 threads white,	1 dent
2 threads black,	2 dents
—	—
90 threads	74 dents

FIG. 12.

The filling for this design must be bright blue. A large range can be produced by varying the colors.

Fig. 13 is a design for a mixed cloth com-

monly called "Ceylon." The warp is of ordinary and mercerized cotton, the filling is wool. Fig. 14 is the design for this cloth. The drafting for the heddles is shown at Fig. 15. The dobby plan for 6 harness is given at Fig. 16.

This style of cloth is fashionable for fancy shirtings and admits of a variety of colorings. Large, bold patterns in black, red, dark green, brown, sky blue and navy grounds, with slate, light heliotrope, fawn, cream, pale blue and light pink stripes are those most desired.

In Fig. 14, the ground is intended to be repeated 9 times, and the light colors and white are marked by crosses, the heavy squares for black threads. The particulars for manufacture are: 32 dents per inch in the reed, 2 and 4 threads per dent, 32s, 2/40s and 2/24s ordinary yarn and 2/32s mercerized warp; 60 picks 30s woolen for filling.

Warping and denting pattern:

36 threads black 32s,	18 dents
6 threads black 2/40s,	2 dents
5 threads slate 32s—	
1 thread black 32s—	
2 threads white 32s—	
1 thread slate 32s—	
2 threads white 32s—	
1 thread light helio 32s—	
2 threads white 32s—	
1 thread black 32s—	
2 threads white 32s—	
1 thread slate 32s—	
2 threads white 32s—	
1 thread light helio 32s—	
5 threads slate,	13 dents
6 threads black 2/40s,	2 dents
36 threads black 32s,	18 dents
2 threads white 2/24s,	1 dent
2 threads black 32s,	1 dent
1 thread white mercerized 2/32s—	
1 thread black mercerized 2/32s—	

FIG. 14.

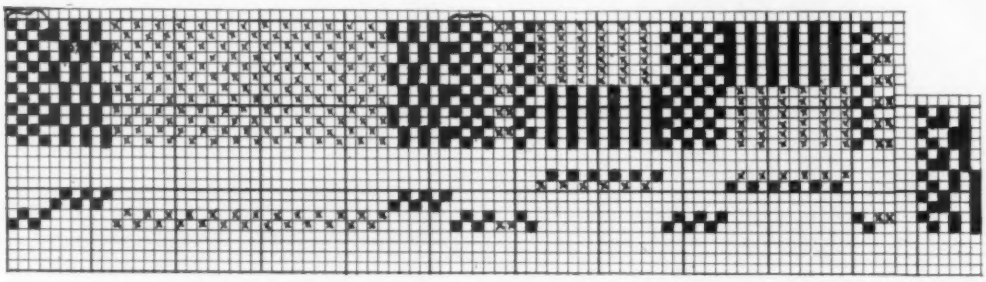


FIG. 15.

FIG. 16.

10 threads, 5 repeats 2/32s,	3 dents
6 threads black 32s,	3 dents
1 thread white mercerized 2/32s—	
1 thread black mercerized 2/32s—	
10 threads, 5 repeats 2/32s,	3 dents
2 threads black 32s,	1 dent
2 threads white 2/24s,	1 dent
—	—
148 threads	66 dents

The filling colors may be drab, light grey, fawn or cream.

The world's production of wool has increased from about 500,000,000 to about 2,500,000,000 pounds, or fourfold, valued at $471,175,000, and cotton from about 300,000,000 pounds to about 10,000,000,000, or over thirtyfold, and valued at $925,850,000.

Japan is gradually ousting the United States from China in connection with the cotton trade. In plain cottons the American trade with China has fallen from 12,600,000 pieces a year to 1,600,000 in 1908, and Great Britain's trade has diminished from 13,500,000 pieces to 9,000,000; while Japan has gained from 800,000 pieces to 1,000,000, and the awakening has only just begun.

ENGLISH NOTES.

(From Our Special Correspondent.)

Due note has been taken of Mr. Patten's criticisms of Lancashire and Yorkshire mill masters. They are "ignorant, untraveled, deficient in business experience, narrow-minded and although perhaps well posted on machinery cannot stand" against the abler and more finished manufacturers in politer countries. "Seventy-five per cent. of them started life as mill operatives." The saying is not devoid of truth and no more are some of the hard things said by Lancashire against Mr. Patten. The personal reflections cancel out, leaving the admission that the elevated operative may understand machines and the prophecy that he will succumb to outside competition.

The fact is that our cotton and worsted industries are so subdivided that a man need not be a universal genius to succeed. He must be efficient at his job of spinning, weaving, finishing or what not. Generally speaking our manufacturers fill their place in the scheme of things and the delicate and complex business of home and foreign distribution is done by competent specialists in their own departments. Manufacturers elsewhere may have broader minds, finer manners and better education, but on the whole it is not their competition that is the serious trouble. The struggle of these half-baked men, one against another, is the competition that is felt most and that has kept the textile organization of this country in a condition to do effective battle with the outer world. North of England manufacturers doubtless might be more polished with advantage, but the system under which the industry works utilizes each contributory for what he is worth and leaves the rest. The parties to the trade are numerous enough to make good each other's deficiencies.

* * *

Short-timing in the cotton trade still stretches before us indefinitely. Short time has cost weavers, according to the president of the Weavers' Association, $6,000,000 in wages in two years. It has cost the operative Spinners' Amalgamation $355,000 in twelve months for special allowances and that $1,200,000 organization closes its books $70,000 to the bad. To the Card-room Association the loss has been intolerably expensive and the 5 per cent. reduction in wages which employers are able by agreement to demand would be anything but welcome popularly. Operatives say they have done their share for the common wellbeing. The cotton industry keeps as clear of strikes for the present as might be expected. A Marple dispute involving 500 people turns on a point of prices for weaving on new Lancashire looms fitted with specially large shuttles to cope with Northrop competition. Sixteen per cent. off weavers' list prices has been accepted where this type is not used. Since the dyers and combers got their advances the worsted spinning trade has been bubbling with small disputes which for the most part have been settled by an extra 6 to 12 cents to doffers and 12 to 25 cents to spinners. Managers cannot get enough hands for spinning, and see nothing but increased difficulty in obtaining them in future when the school-leaving age is raised and notions of personal dignity are still more lofty. Hold what opinions he may about child labor, the man in charge cannot overlook the fact that the child who begins piecing at eight turns out better yarn all her working life than the one beginning at nine, ten or thirteen. The thing is so and there is no denying it. Instancing the straits some mills are in, I could name one which has to make shift on several frames with married women who had left the mill as they thought forever. After the children are off to school they put in two hours minding in the morning and two again in the afternoon, hurrying as soon as their spell is over to get the family meals ready.

* * *

A point in the United States trade mark law has been brought to the attention of exporters in Bradford. It seems the law confers power on the Customs to stop the entry of goods bearing marks simulated to deceive the public. Advice is given to exporters to register their marks with the

United States Treasury Department for possible use in the event of unfair competition. Under British law the Customs have the same power and exercise it when knives arrive from Germany with some Sheffield or other English mark. Not so much is heard of its employment to protect one foreigner from the depredations of another, but the law is there to be used.

* * *

In fulfilment of pre-existing contracts the bloating of Lancashire's manufacturing equipment was continued into last year. Some 703,400 new spindles and 1,815 additional looms are recorded by the diligent Worrall. The same authority makes out that there are altogether 57,731,829 cotton spindles and 741,197 looms owned by 1,977 firms. Since 1900 the spindleage has been increased 35.37 per cent. as against an advance of 14.24 per cent. in the number of looms. It was thought at the beginning of the century that Lancashire was fairly well equipped for the export yarn trade. It is seen with half an eye that more foreign orders are requisite now and there is more Bombay and Japanese competition for business in coarse counts.

* * *

The British empire (India excepted) is sluggish in producing cotton, but it continues to furnish great wealth of wool. Receipts in the last calendar year in Europe and North America include 2,351,000 bales from Australasia and 400,000 from the Cape. These with East Indian, Falkland Island, United Kingdom and sundry British sources go far to supply the world. The foregoing figures are Schwartze's. The Colonial Office supplies statistics of the interesting expansion of wool growing in Basutoland. As lately as 1896 the contribution of that well watered and eminently suitable area was a million pounds of wool and 68,000 pounds of mohair. Contrast the 1908 record of some 4 1/2 millions of wool and nearly one million of mohair. Further expansion is promised by the increased use of Rambouillet sires.

Schwartze's continue their usual calculation of the disposable quantity of clean wool per head of European and North American population. The amount is 2.26 pounds in the 1861-70 decade, 2.43 in the seventies, 2.57 in the eighties and 2.76 in the nineties. In nine years of the new century the average is 2.64. The proportion has improved from 2.61 pounds in 1901-5 to 2.69 in 1906-9, but there will be setbacks again and to avert future panics more wool is wanted.

* * *

The British and Canadian governments are having a little discussion about noils. The Canadian customs people have arrived at the opinion that noils are not "pure wool" and that blankets made from noils ought therefore to pay an excess of duty. By the same brilliant reasoning steel filings are not steel, minutes are not time and miles are not distance. Are tops pure wool and what is the greasy, burry substance that is shorn once a year from sheep? As the tariff refers to pure wool, Canadian officialdom will perhaps concede that there is such a substance and on second thoughts will doubtless agree that it may exist in different forms, just as pure water does.

* * *

For the second time in three years the prices for woolcombing have gone up, so that charges are now 12 1/2 per cent. more than in 1906. The new advance of 5 per cent. has for its excuse the higher wages now being paid to operatives. A statement of the prices (which of course are charged on the weight of top returned) follows:

All Above 56s Quality.

5-lb. Top to 1-lb. Noil	pence 2¼
4 to 5-lb. Top to 1-lb. Noil	pence 2½
3 to 4-lb. Top to 1-lb. Noil	pence 2¾
2 to 3-lb. Top to 1-lb. Noil	pence 3¼
Burring	extra ¼
Gilling-in	extra ¼

Carding Crossbreds.

56s	1⅞
50s 7-lb. Top and over to 1-lb. Noil	1¾
Under 7-lb. Top to 1-lb. Noil	1⅞
36s to 40s 8-lb. Top and over to 1-lb. Noil	1½
Under 8-lb. Top to 1-lb. Noil	1⅝
Burring	extra ⅛
Gilling	extra ¼

Preparing.

32s, 36s, 40s	1⅛
Over 40s	1¼
Slipe and Skin	extra ⅛
Burry and Seedy	extra ¼
Gilling	extra ¼
Scouring, per lb. of washed wool	⅝

Professor Meldola has been reminding the Society of Dyers and Colorists that there will not be coal tar colors forever. A few more centuries and the coal will be worked out and what will dyers do then? It is comforting to assume that the color makers will be equal to the emergency and succeed in grouping molecules in the desired manner, perchance out of wood. The professor spoke of dyeing as both an art and a science, with a scientific side of comparatively recent development. Outside public speeches one does not find dyers rating very highly the general level of scientific skill prevailing in the trade in England; nor find them convinced that dyers are more scientific than they used to be. "Some of us were scientific forty years ago. Some of us are scientific today. That's about all you can say of it," says one dyer of good attainments who is not at all disposed to disparage the value of knowing dyeing as an art. Science teaches the student to know, but it is art that shows him how to apply knowledge. Even the chemists in the color works pick up points gladly from the "practical" man concerning the behavior of colors in large-scale experiments.

* * *

The growth of the fancy knit goods business accounts for a good deal of Leicester's new prosperity. The prosperity of this head center of the English knitting trade can be measured roughly by the failure of recent attempts to attract several hundred skilled girl operatives to Canada. They were offered 30s. ($7.50) a week and were guaranteed continuous work at all times of the year. Few responded, for Leicester gives them eleven months' work in the year and wages of $5 to $8.75. Compared with many Lancashire and Yorkshire towns, Leicester is a pleasant place. Dyed goods like golf jackets, fancy waistcoats, motor scarves, knitted linings and gloves have been well ordered for next winter. The Leicester elastic web business has been disorganized by the advance in rubber.

* * *

The metric system is far outside of practical politics and Professor Barker's advocacy of its use in textile industry is rather interesting than serious. He has found that metric measures can be used and has had textile students at Bradford working with them for eighteen months. But mill men in Bradford are not burning to use them and in view of the common level of education among operatives the fact is not surprising. Why confound with worse figures and more awkward reckonings the lad who with vast difficulty is just grasping the fact that a twentieth is half of a tenth? Managers do encounter lads who never have seized that truth and who apparently never will do so.

Professor Barker likens British measures to sail and French ones to steam, gives heroic advice about driving against wind and tide and concludes with a more or less pious opinion that our textile efficiency would undoubtedly be benefited were metric measures used in the mill. One may say as much of matters that would not involve a hundredth of the confusion and expense. Metric measures are free and open under the law for adoption by any manufacturer. The head of the Textile Department of the College only very distantly hints at compulsion and, oblivious of American and other precedents, suggests that the yard, the ounce, the pint, pottle, peck and other relics of mediaevalism would disappear were the British coinage decimalized.

* * *

A mill man of years and experience attributes the failure of so many males to gain advancement in textile manufacturing to what he calls the lumpheadedness of 16 to 18. One illustration will serve. He asked a boy of the latter age who had been two years in the finishing room if he knew by this time how much soap was requisite to scour a piece? The lad did not. He had "niver takken no nooatice." And as in that

mill nobody concerns himself to see that lads are given an intelligent understanding of the work they take part in, the answer is not surprising. When he is twenty and when the chance of promotion comes along, this youth will be just as sorry as thousands have been before him. His future will be one of sweeping roads and driving carts and any other man will always be able to do any work as well as he.

Simply as a matter of historical accuracy I add that no one takes so much trouble to see that their youths learn as certain Jewish firms of cloth merchants. Although so many manufacturers seem not to think so, it pays to take a personal interest in young and foolish assistants and see that they understand their own business.

* * *

English dye-house and weave-room managers are accused by a Manchester lecturer of being heedless of belting and transmission losses. He had heard a weaving manager say that belts in some sheds are thought no more of than the grindstone. He gave an instance of neglect in which looms running 186 picks per minute ran 208 when the belts were duly trimmed. A bleaching firm besides getting better results continuously, saved 40 per cent. of the cost of belting in the second year of their campaign of improvement. Mr. Chadwick is probably right in saying that spinners, of all textile men, are most alive to the advantages of steady, thrifty driving. But one knows both weavers and dyers who are not so lost to all sense of economy as the lecturer's awful examples. In this country there must be an immense aggregate loss of power arising from a cause apart from the active efficiency of the belts used. The mistake is made of settling in old and awkwardly constructed premises of which the first cost may be low. Taking one inconvenience with another and adding in the item of loss in transmitting power, the last cost is apt to be heavy. Bad belts in a bad scheme of lay-out are costly enough to be conspicuous in accounts.

The imports of lace goods into the United States last year amounted to nearly $40,000,000.

WOOL CLASSING IN NEW ZEALAND.

Instruction in wool classing and sorting was inaugurated in the Napier Technical School in March last, and about fifty students enrolled to receive tuition from Mr. S. Wood, whose experience was gained at Bradford, England. The students applied themselves diligently, and their enthusiasm proved so strong that classes of instruction under the some tutor were started in all the chief centres of Hawke's Bay and Wairarapa, and Mr. Wood was busily engaged in imparting his knowledge of the golden fleece to over three hundred students.

The work embraced the handling of fleeces and pieces, and this had to be thoroughly gone into, for quite a number of the students were clerks from the various brokers' offices and had not had experience in handling wool. The bulk of the students, however, were farmers, while a fair proportion were storemen engaged in work at the wool stores. After the pupils had become adepts at folding, throwing, skirting and rolling fleeces, and had learned to distinguish pieces from second pieces, the study of wool was begun.

Papers on the theory of the subject were prepared by the instructor and were read to the classes. Fleeces were examined in regard to the condition, color, strength, length of staple, general characteristics, and were sorted according to quality or Bradford spinning count. Each Saturday's lesson revealed something new for the study of the pupils, and fresh wool was constantly coming and going for their sorting.

When the pupils had become sufficiently trained in sorting according to quality, large wooden trays were supplied to them containing a number of bins or divisions into which they had to sort piles of pieces according to the various spinning counts. These pieces were made up chiefly of the fleeces that had been split up or divided into counts during previous lessons, and also bales of pieces supplied by one or two general local scourers. The pupils were required to make sorts ranging from 32s or low crossbred to 60s or merino. This was the chief part of the practical work during the term. It was interest-

ing to note that pupils, who were unable to detect any difference in the quality of wools at the outset, after a few months' practise could sort up the different qualities in correct style.

The classes terminated for the year on Saturday, October 9th last, when the Napier pupils were examined in theory and practice by Mr. Wenley, of the local firm of wool brokers, Wenley & Lanauze, Ltd. There were fifteen candiates, and out of these eleven succeeded in passing, nine being in the first-class division. The candidates were examined in theoretical and practical work. A time limit of one hour was fixed for the following theoretical paper:

What is the object of classing wool? Why make any difference in classing a small farmer's lot and a large clip? Why should wool classers try to avoid having any lots less than three bales in clips offered in London? Should bales be of even weight; if so, state why, and what should be the average weight per bale? Why do American buyers buy only light-conditioned wool? What is meant by "condition?" Why do buyers dislike "tender" wool? State the difference between combing, carding, warp and weft wool. Why is vegetable matter so objectionable in wool? What is meant by the terms 36s, 44s, 50s, 40s, etc., as applied to wool, and what is the length in yards of 1 lb. of 40s yarns? What are "Crimps," "Serrations," "Tops," "Noils" and "Waste"? Give a short description of how you would set about classing and despatching to the port a crossbred clip of, say, 150 bales from a Lincoln and Romney flock, there being some pure Romney and pure Lincoln sheep, and remainder being a cross between the two.

The examiner reported as follows:

Practical Work.—The instructor and students have been handicapped throughout the session by the lack of a good selection of wool, and it would be of great advantage to next winter's classes if a few growers presented a selection of fleeces of different qualities to the school. The only wool available for this year's test was a rather inferior selection of pieces ranging from poor merino to low crossbred. The classing out of qualities was well done, and all the students have derived a knowledge which will be of advantage to them in any department of practical work they may engage in. If possible the instructor should try and arrange for the students to visit one of the large up-to-date sheds during shearing.

Theory.—On the whole the results are good. Paper No. 9 was excellent, and if the writer has the opportunity of working out practically his reply to question No. 12, an exceptionally well-classed clip would result. In addition to the above there were four very good papers, two good papers, and two very fair papers. Of the remainder, two are moderately good and four are poor. Although the practical work of these four is fairly good, I do not think students are entitled to certificates unless they have a moderate knowledge regarding the reasons requiring a clip to be classed and well "got up."

Those pupils who have taken the course of instruction must have benefited very much, especially the farming students, as they will have added to their store a knowledge something of the great staple product of their country. It is appalling how little farmers actually know of the quality of wool, and even this season there are farmers whose flocks will only clip 40s fleeces at the most, grumbling because they cannot understand why a neighbor, whose clip averages 44s to 46s, get a penny or twopence more per pound for his wool than they do. When they are more familiar with the spinning quality of different wools they will be better able to apppreciate the difference in prices obtained for various clips, and they will be spurred on to improve the breed of their flocks to obtain the best paying fleeces consistent with the sheep most suited to run on their farms.

The wool buyer will also be benefited by the spread of his knowledge among the farmers, for the reason that he will find them more amenable to reason, providing the prices he offers are fair. The farmer realizing that he has a low crossbred clip will not

expect the same price that his neighbor will receive for a medium crossbred clip. Yet in the past, and during the present season, buyers have had to face this difficulty in making deals. The benefits accruing to clerks and storemen in wool brokers' establishments are so obvious that it is hardly necessary to dilate upon the advantages they have gained by attending the classes.—Dalgety's Review.

CARD GRINDING.

(From the Grinding and Mounting of Card Clothing recently published by Dronsfield Bros., Ltd., Oldham, England.)

(Continued from April.)

The long grinding roller does not possess this side grinding action to the same extent, inasmuch as the full body of emery extends across the full width of the card surface, the teeth are not regularly deflected, and cannot regain their original position so freely as under the action of the narrow emery wheel.

Another point to consider, while on the subject of point grinding, is fusion or flowing of metal caused by abrasion of the emery. In the case of wheel grinding the wire has a considerable length of time to cool off after the grinding contact before the emery wheel again abrades it, but in the case of the long roller the abrasion is practically incessant; this is one of the main causes of barbed and hooked points.

The speed of cylinders and doffers during the grinding operation has been from time to time a much discussed question. At the present day quick speed of revolution is considered by the great majority to be the correct thing. Cylinders are run at working speed 160 to 170 revolutions per minute; doffers at a proportionate surface speed, about 340 revolutions.

In setting grinders to work on cylinders and doffers the steps or brackets carrying the grinders should be brought parallel with the cylinder. They should be carefully gone through from time to time, as parallel setting is an important item. The tendency of "skewed" brackets will be to cause hollow grinding, as the emery covered surface grinds more from the center than at the ends. This difficulty of hollow cylinders and doffers has been frequently traced to the steps; a little attention to this detail will save the carder much worry.

The frequency of grinding is a debatable point, but really no hard and fast rule can be applied. Without question, however, the best and surest means of keeping card clothing up to "concert pitch" is by frequent grinding, and at the same time light contact of the emery covered grinder, traverse wheel or long roller. The grinder should never be set to bear heavily on the wire points, no matter what condition the card clothing be in.

The acme of perfection in card grinding is

FIG. 22.

produced by light setting, not indeed so light as barely to touch the points, but sufficiently to cover the surface of the card teeth points in order to deflect them slightly in course of grinding. This should be done frequently according to the condition of the wire, taking into consideration the class of cotton in use and the weight carded. Far better results are gained by this system than by long and heavy grinding at long intervals. The grinding of card clothing may be likened to the honing and stropping of a razor, with this exception, that the honing has been done by the card maker once and for all; the grinding of the card under working conditions is the stropping process, light and frequent. It is better to grind, say, once a week under these conditions than to grind long and heavily once a month. Heavy grinding is the cause of barbs and hooked points, soft points, owing to the temper having been destroyed, loosening of the tooth crowns in the foundation of the clothing, and eventual breaking out of card wires.

If the cylinder should be very irregular, it is a good plan to use a well made and balanced long grinding roller, Fig. 22, for the first grinding, and finish with the traversing

emery wheel grinder, and improve the point and keep the cylinder true, but always set lightly. The carder should pay attention to the cylinder and doffer surfaces before commencing to grind, to discover the presence of any deflected or crushed teeth caused by the penetration of broken seed. If these should be felt for any length of time, they will ultimately cause trouble when drawn up, through being of greater length; these long wires should be clipped off. Embedded seeds of large size should be also picked out; frequently these are to be found embedded at the roots of the wires, and cannot be reached by the stripping roller.

2. Flats on the Card: Although much has been done by the makers of revolving flat cards in regard to the improvement of the mechanism in connection with the grinding of revolving flats while working, much still remains to be accomplished ere these all important organs are treated with that precision so necessary to good carding. There are many things which militate against the perfect grinding of flats on the card in such a manner that each and every flat shall be ground alike and be capable of regular setting to the cylinder. This is a matter we shall deal with later. Conditions demand that the flats should be periodically ground in order to replace the worn points, and with this, the grinding of the flats while upon the card, we have now to deal.

The grinding of flats is generally accomplished by the aid of the patent long grinding roller with traversing motion, Fig. 22. This roller is built of steel throughout, save the end blocks which carry the shafts and the traverse motion, and, when complete, is balanced to run at high speeds. The roller is tested to run at 2,000 revolutions per minute. Every part has received the greatest attention in course of manufacture; the barrel, after being turned, is ground perfectly true laterally and cylindrically; the shafts are of hardened steel. The roller is adapted for and covered with emery fillet guaranteed true in thickness.

The object in using a long, full-bodied grinding roller for the purpose of grinding revolving flats is explained by the fact that the full width of emery strikes the full width of the flat and one line of teeth from end to end of the flat is ground simultaneously; further, the grinding is done quicker owing to the slow speed of rotation of the flats round the circuit. We would say, however, that better points and greater "truth," although not perfection of truth, would be attained by the use of the emery wheel grinder. It would be surmised, from reflection on the point of "truth," that the emery wheel in its traverse would not attain the full width of the flat ere the flat had left the wheel; this is undoubtedly true, but a longer period of grinding would abolish any possibility of irregularity. This lengthened period would not be comparative either, as the point produced by the traversing wheel is better, for reasons explained, than the roller point. In support of this statement, we may state that many first class spinners have adopted the emery wheel grinder for top flat grinding, in order to obtain the acme of perfection in carding. The difficulty in respect to the possibility of unequally ground flats is overcome by a lengthening grinding period, and this, seeing that the grinding of flats is done during the carding process, does not interfere with production in the shape of lost time, as is the case with cylinders and doffers.

FIG. 23.

(To be continued.)

The exports of raw cotton from the United States in 1909 amounted to 4,447,985,000 pounds valued at $419,733,103, compared with 3,816,998,500 pounds valued at $437,788,202 in 1908.

PLAIN VELVETS.

BY GAUL.

(Continued from March.)

Velvets may be divided into two classes: 1, velvet for clothing, and 2, velvets for upholstery purposes. Both classes are manufactured on the same principle, the following classification being based on variation in construction: a, single filling; b, double filling; c, triple filling, etc. These classifications indicate whether the filling consists of one, two or three ground picks for each pile pick.

Double Filling Velvet. Two arrangements of the pile are permissible in this construction. The cross sections are shown at A, Fig. 5. The pile pick passes under all the ground picks and over the wire, the

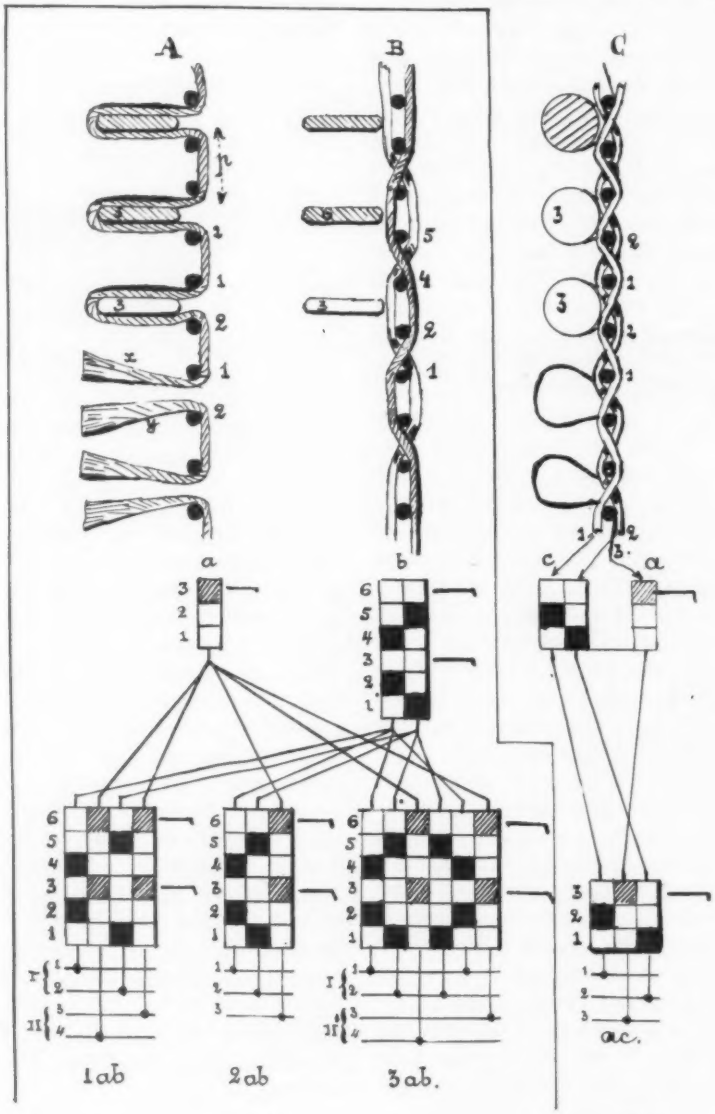


FIG. 5. FIG. 6.

draft, a, showing the order of weaving. The two tufts, x and y, pass between the same picks and are thus finished together. This method of weaving is called the "iron knot." If it is desired to stitch the pile threads by

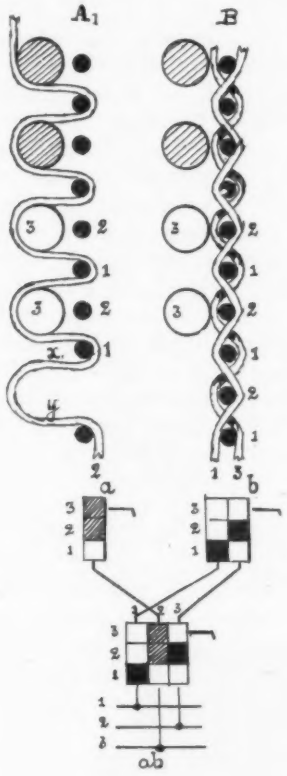


FIG. 7.

the ground threads this may be accomplished as shown at B, Fig. 5. The threads interlace in two and two rib order. The order of intersection is shown by the draft, b. The drafts, a and b, can be combined to produce the weave shown at 1 ab, 2 ab and 3 ab. In the weave shown at 1 ab, there is one ground thread for one pile thread. In the weave, 2 ab, the number of ground threads is doubled. In the weave, 3 ab, a basket effect is obtained by repeating the ground threads.

Fig. 6 shows the same kind of a pile. The wire is round instead of elongated in order to obtain a boucle effect. The construction shown at A is not often used because of the liability of the pile being pulled out or displaced by friction. On the other hand the construction shown at A 1, Fig. 7, is very popular. The intersection of the warp is shown at a. The pile thread rises over the pick preceding the wire. As a result the tufts, x and y, are separated by the pick, 2.

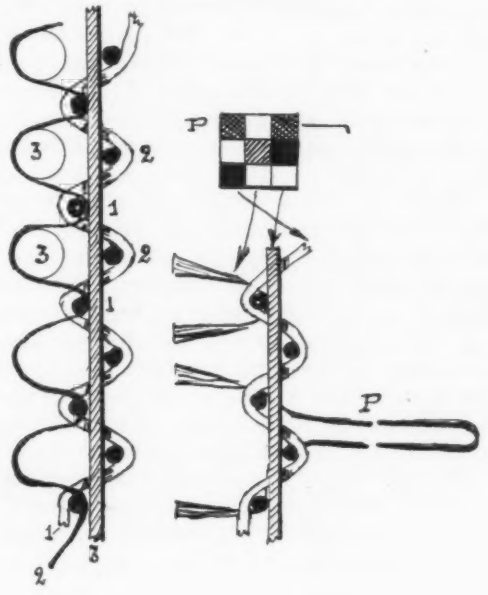


FIG. 8. FIG. 9.

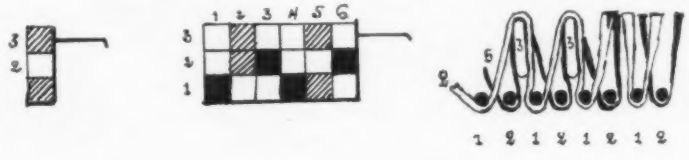


FIG. 10 FIG. 11. FIG. 12.

This arrangement is called the "iron bed," for the wire, in place of resting behind the pick, 2, comes directly over it.

From what has been said it will be seen

that the velvets can be divided into two classes, 1, velvets with the "iron knot," and 2, velvets with the "iron bed." This is the classification adopted in silk mills.

The fabric shown at Fig. 7 is made with a plain weave for the ground, the draft for both ground and pile threads being shown at ab. Velvets made with this draft on the round wire are very popular. The pile yarn is single, double or triple organzine, the filling being silk or cotton. The warp is reeded three threads in a dent, the reed having 33 dents per inch and a width of 20 inches. Usually there are 51 wires woven to the inch; on the hand loom the wires are drawn out by a helper.

Fig. 8 shows the section of a weave varying from the one shown at Fig. 7. The threads, 1, called false ground threads, are woven with very little tension, while the threads, 3, are tighly woven, the two forming the ground. In weaving ribbons it is necessary at times to resort to this construction which is also employed for the manufacture of oil wicking, which is used for oiling shafting of large diameter.

The pile warp is usually 2/3s worsted but at times cotton of the same size is used. The ground and false ground threads are 2/3s cotton, while the filling is single 2s to 3s cotton. The warp is reeded with three threads in a dent, there being 9 dents to the inch. The filling varies from 7 to 12 picks to the inch. This wicking varies from 4 to 12 inches in width and from 6 to 12 inches in length. During weaving two lengths of wicking are separated by a certain number of plain picks. Loops for taking up the oil are woven on the back of the wicking. This can be added after or during weaving by aid of rods which are passed under the fabric. Fig. 9 illustrates this construction. The loop, P, being from 4 to 6 inches in height. These goods are woven exclusively by hand.

Fig. 10 shows a third construction for double pick velvet in which the pile thread passes below the pick preceding the wire and rises above the pick that follows the wire. This construction is rarely used because it does not hold the wire in a vertical position. In combining this weave with that shown at Fig. 7 the weave shown at Fig. 11 is obtained, the section of the fabric being shown at Fig. 12. This is called a symmetrical pile and the construction is entirely practical. The velvet made with it has tufts of different lengths. It will be seen that in this fabric the pile thread, 2, interlaces the filling in the order shown at Fig. 10. In weaving this cloth by power the first wire tends to draw to the right the pile threads that pass over it. Thus the pile thread, 2, Fig. 11, has a tendency to slip over the thread, 3, which rises over the same pick. This is not the same with the pile thread, 5, whose intersections are opposite to those of thread, 6, at the right. As a result the last pile thread is held in better position in the cloth. From the study of the double pick velvets it is possible to deduce the following rules which are equally applicable to velvets:

1. The methods of stitching the pile threads to the ground fabric are limited to the number of picks between two consecutive wires.

2. This stitching can be done by the "iron knot" or the "iron bed."

3. The base of the tuft on the back of the cloth should be concealed as much as possible.

4. In a velvet in which the pile is regular, the pile threads should pass below the pick following the wire.

5. In power weaving the pile threads and the adjacent ground threads should intersect the filling in opposite order.

(To be continued.)

During January, 1910, there were $21,146 worth of lace machines shipped from Plauen, Germany, as compared with $4,593 worth during the same time last year.

As an illustration of the industrial importance of American cotton, not less than 9,000,000 persons are employed in its production, handling and manufacture. Of this number, about 6,000,000 are farmers and farm laborers; about 1,000,000 are otherwise engaged, to some extent, with the raw material in the United States; while at least 2,000,000 are concerned with it in foreign countries.

Questions and Answers

Under this head we undertake to answer, free of charge, to the best of our ability, questions pertaining to textile matters received from any regular subscriber to the TEXTILE WORLD RECORD. Questions should be stated as briefly and concisely as possible. Inquiries pertaining to textile processes, machinery, improvements, methods of management, the markets, etc., are especially invited, as well as any legitimate discussion on the views expressed. All inquiries must be accompanied by the name of the person inquiring, not for publication, but as an evidence of good faith.

If the question is not of general interest to textile readers and involves expensive investigation, a charge covering the cost may be made, of which the inquirer will be advised before any expense is incurred.

Cotton Worsteds.

Editor Textile World Record:

Please inform me whether cotton worsteds are ever made with as small a quantity of worsted as 2 per cent. of the weight of the cloth. A manufacturer has stated very positively that "no manufacturer would make a fabric containing only 2 per cent. of wool." He adds that "such a small percentage of wool would be imperceptible, and there would be no object in using it, as it would add slightly to its cost without making it any better than if composed of 100 per cent. cotton."

Dover.

Large quantities of cotton worsteds are made with as small a quantity of worsted as 2 per cent., the remainder of the cloth being cotton. The worsted in such cases is in the form of plaiding or striping threads. Even this small quantity of worsted has a pronounced effect in giving the cloth an appearance of real worsted goods. A sample of such a fabric, made in the vicinity of Philadelphia, is shown at Fig. 2. Fig. 1 shows the cotton residue obtained by boiling the cotton worsted, Fig. 2, in a solution of caustic potash. The green worsted splicing threads are very perceptible in Fig. 1. Theoretically the boiling solution of caustic does not affect the vegetable matter. Practically, however, it removes a small quantity of dyestuff and vegetable oils or waxes. For this reason it is necessary in testing cotton worsteds having so little worsted, to increase the weight of the cotton residue slightly, say by 2 per cent., to allow for this loss. If this is not done the result of the test will be misleading, as the cotton itself will lose as much as the worsted amounts to. Our test of the sample shown in the illustration resulted as follows:

FIG. 1. FIG. 2.

Before boiling,		11.6 grains
After boiling, 11.2 gr.		
Add 2%,	.2	11.4 grains
Wool dissolved 1 7/10%,		2 grains

This is probably about as small a quantity of worsted as is ever used in a cotton worsted fabric, although it is easily possible for a larger plaid effect to be made with even less than 1.7 per cent. There are large quantities of cotton worsteds made all cotton, and the proportions of worsted vary from 1 or 2 per cent. to 50 per cent., or even more. It is doubtful if much cloth is made with less than 50 per cent. cotton, as the advantage to be gained would not compensate for the depreciation of the selling price below the price of all worsted goods.

The imports of dress goods in 1909 have decreased from $9,135,688 to $7,019,284. Wearing apparel has decreased $66,227.

Bleaching Skein Yarn.

Editor Textile World Record:

We are bleaching cotton skein yarn and piece goods and have more or less trouble because the bleached goods are not soft enough. We use the best grade of English chloride of lime. The cotton yarn is treated in a weak acid bath. A high grade of soap is used and every care is taken in finishing the goods after bleaching. The goods, however, have not that soft feel desired by the trade and we would like to have information that would help us to remedy this difficulty.

Augusta (1180).

There are a good many causes for this difficulty, of which the following may be mentioned: The yarn may not have enough twist. There may be a natural hardness. The goods may not have been boiled long enough. They may be underbleached. Or the boiling liquor may be too strong with caustic and not enough soap to counteract the action of the caustic. In bleaching yarn or piece goods there is not a very wide margin to experiment on and the goods can be tendered very easily. If they are overdone the process is a complete failure. The sample of yarn submitted would certainly stand a little more boiling, as well as a little more bleaching. "Augusta" does not state whether the goods are caustic boiled or not. If they are I would advise using more soap in the boiling liquor and boil them a little longer, and thus lay a foundation for a soft finish on either yarns or piece goods. I would advise using sulphuric acid as a neutralizer for the chlorine. It is much better than hydrochloric acid, as it gives a softer feel. In bleaching both yarns and piece goods do not be afraid of a little soap or soda ash in the boil as they are essential to a soft finish.

It is as important to get the goods white and soft in the bleaching bath as it is in the boiling bath. When mixing the chloride of lime in the mixer or agitator, add from 1 to 2 per cent. of soda ash with the chlorine powder, letting them mix as with the chemic itself. When this has cleared or settled, use the mixture at the usual strength for bleaching purposes and the goods will come out whiter and softer than by using the chloride of lime alone. Use plenty of the best soaps and softeners in the finishing process. Do not use too much as this would make the goods smell, which is as bad if not worse than sending them out with a hard feel.

Delco.

Waterproofing by the "Millerain" Process.

Editor Textile World Record:

I note you state in your March issue in answer to an inquiry regarding the waterproofing of Gabardine cloth, that this is worked in England and Germany, but not in the United States.

Allow me to say that there is a plant in Wissahickon, Philadelphia, operating under the name of Miller & Harrison and known as the Rellim Rainproof Process, that can rainproof Gabardine or any other textile fabric as well, if not better, than any other process used in the United States or Europe.

C. W. C. Miller, the chemist and superintendent of the Rellim Rainproof Process plant, is the son of the late John Miller, Sr., inventor and patentee of the Millerain process, Halifax, England, and with whom he was connected for about five years, leaving there about two years ago. For the past fifteen months he has been operating the Rellim Rainproof Process plant in Wissahickon.

If you will kindly make mention of the above in your next issue of the Textile World Record, it will greatly oblige,

Yours very truly,

Miller & Harrison.

Wages Paid for Comb Tenders.

Editor Textile World Record:

Can you inform me what wages are paid for Noble comb tenders in a few of the American worsted mills and if they look after a comb and a half or two combs each? What is paid finishing gill box tenders and do they run two machines or more? Quebec (1184).

Comb tenders in Lawrence, Mass., are paid from 13 1/2 to 14 1/2 cents per hour, attending two combs. The mills around Fitchburg pay 12 1/2 cents for two combs. Finishing gill box tenders in most of the Lawrence mills are paid 11 1/2 cents for attending four boxes. One of the large mills pays 12 cents. Fergus.

Undervaluation of Worsteds.

Editor Textile World Record:

I have read with interest your monthly comment in the March issue on the imported English worsted cloth and would like to know what quality of yarn is used in these goods and the price at which the yarn can be bought at Bradford. I would also like to know what kind of wool is used for manufacturing the yarn. I have an idea that it is wool shrinking so heavily in scouring as to be excluded from the United States by the specific duty. Penn Yan (1179).

We referred "Penn Yan's" inquiry to our Bradford correspondent, whose reply reached us too late for the April issue. It is as follows:

As to the supposition that these goods are made out of wool which shrinks too heavily to be imported into America—there is obviously no universal rule. So long as he gets his quality and gets his clean wool cheap enough the Englishman does not care what the shrinkage is, whether he pays 9 pence for wool losing 33 1/3 per cent. or 8 pence for wool losing 50 per cent. is immaterial. The clean wool costs a shilling in either case and he will take either or both or preferably the one that shows a little more than the strictly proportionate advantage.

Now if you have a set of buyers whose aim is to buy merino and fine crossbred, losing not more than 50, and as much less as possible, their rivalry with each other tends to put a premium on this limited class of stock. They bid up for this "tariff wool" and make it proportionately dearer than stuff they can't buy because of its heavier shrinkage. They do an injury to themselves and a favor to their free competitors. The wool they can buy is made artificially dear and the wool they cannot buy stands unnaturally cheap. Competition, instead of being equal all round the range of offerings, is confined so far as the tied men are concerned to a special selection. This is what happens in London and—as was reported at the time—Americans were paying last year a penny to twopence per pound of clean wool more for light-shrinking wool than other people were for clean wool out of raw stock heavier in condition. When Americans are keen to buy all the light wool that comes forward it stands to reason that English and Continental buyers will favor the wools for which Americans cannot bid until such time as there is no longer advantage in doing so.

On the other hand when America is not eager, and light and heavy wools are relatively on the same basis of value, there is likely to be a larger consumption in Yorkshire of wools that Americans could buy but do not. Now that fine crossbreds in light condition are 5 to 10 per cent. cheaper than in January, it is probable that more of them fall into English hands. So much for the subject of shrinkage. These are the considerations that dictate the policy alike of topmakers for the general market and of manufacturers buying raw wool and combing for themselves. There is this difference between those two parties that, whereas the manufacturer or spinner who makes his own tops tends to make them of "straight" wool, the topmaker inclines to get his effects by going a long way round and blending together wool from many sources.

The price paid for tropical worsteds determines in the long run whether they are made from tops out of which a heavy proportion of noil has been extracted, whether discolored tops are used for dark dyeing and black, and whether a common or fine or superfine quality of one denomination is employed. Taken together, economies of this kind make a material difference in profits when prices are cut very low and there are considerations of keeping the plant at its maximum and the avoidance of heavy pattern and selling costs to reckon in. The number of colors and twist threads and the length and uniformity of warps all assist in making those differences in price which I have previously noted, and the big consumers of yarns or tops of course reckon on some slight advantage over small buyers by reason of the size and value of their orders. Fancies are not so often weighted in finishing as piece-dyes, but the goods have to be made to a specified weight and the maker cannot submit to much loss in finishing.

It is necessary to recapitulate these cir-

cumstances in order to aid in understanding the situation. I now give the prices of certain yarns. I assume that the yarn used is 2/48s out of good 64s quality. Today's price (March 24) is 3s. a pound, with a possibility of buying from some quarters at 2/11½. The usual 60s top does not spin much finer than 40s, but 2/48s yarn can be had as follows:

Out of 58s tops ..... 2s. 10d.
Out of 56s tops ..... 2s. 8½d.

These are present prices and are higher by 1—1 1/2d. a pound than those of December-January. Black yarn costs 4d. more than white, twists cost about 8d. more than white and marls about 9d. more. I am told there is not much discolored material to be got that is fit for 2/48s yarn, but the price of yarn only fit for dark shades would probably be 1d. less than white.

This is the best reply I can give under the circumstances and I hope it will be useful to you and arrive in time for April.

Wessex.

Sizes of Sweater Coats.

Editor Textile World Record:

Please give us the standard sizes of men's, ladies' and misses' sweater coats. Buxton (1176).

The following scale of sizes of sweaters are accepted as being correct. These are of course subject to change as regards lengths of the ladies' goods, as these are being bought in lengths of from 27 inches on 40 up to 39 inches and longer:

Sizes.	Width.	Length.	Sleeves.	Armhole.
34	15	25	19	9
36	16	26	20	9½
38	17	27	20	9½
40	18	27	21	10
42	19	27	21	10
44	20	28	22	10½
46	21	28	22	10½

Ladies' Coats.

Sizes.	Bust.	Waist.	Length.	Sleeves.	Armhole.
34	16	14	27	20	7
36	17	15	28	20	8
38	18	15	29	21	8
40	19	16	30	22	9
42	20	17	31	22	9
44	21	18	32	22	10

Misses' Coats.

Size.	Width.	Length.	Sleeve.
20	10	14	16
22	11	16	16
24	12	18	17
26	13	20	17
28	14	22	18
30	14½	24	18
32	15	25	19
34	16	26	19

Winding Mercerized Yarn.

Editor Textile World Record:

We are having considerable difficulty in winding 2/24 mercerized yarn. This yarn is kept in the basement where all our woolen and worsted yarns are kept. Should mercerized cotton yarns be stored in a damp or dry room? Sidney (1182).

The trouble is no doubt due to some cause other than being kept in the basement. It is the general impression that all yarns should be kept in the basement, especially is this true in regard to yarn for knitting. I have found that all hard twisted yarns work much more satisfactory if kept a little damp, as this has a tendency to take out the wiry feel. "Sidney" does not state what the nature of the trouble is and whether the yarn is on skeins or cones, and for this reason it is difficult to answer the question intelligently. However, it is perfectly safe to keep the yarn in the basement unless it is found to be exceptionally damp.

Merrill.

Prices Paid for Winding Yarn.

Editor Textile World Record:

Can you tell us what the average piece price is per 100 pounds for winding 2/16 and 2/26 worsted and 2/20 wool from skeins to 17-inch bobbins? Lawrence (1177).

The prices vary according to conditions, such as quality of yarn, condition and make of winder and locality. An average price for this work is about as follows:

2/16 worsteds, 75 cents per 100 pounds.
2/26 worsteds, $1.25 per 100 pounds.
2/20 wool, 90 cents per 100 pounds.

Merrill.

I find that I have wound 2/15, 2/20 and 2/26 worsted yarns and paid $1.50 per hundred from skeins. My experience on this class of yarn, however, has beeen limited.

Madison.

Knitting Department

THE KNIT GOODS SITUATION.

There is a between seasons' dullness now resting upon the primary selling departments of most lines of knit underwear. Manufacturers of light weights report very few duplicate orders during the past month, but at the same time they add that they could not take care of them if they received them, for they are nearly all very much behind in the delivery of merchandise sold last June and July. At that time, the buyers placed their orders very liberally and conditions have been such as to delay manufacturing ever since the orders were taken.

Occasionally an order is sent in by a jobber, duplicating on some of the styles he has had, but in nearly every instance, the manufacturer is obliged to reply that same might be accepted for delivery from May 20th to June 1st at advances from 7 to 10 per cent. over the prices originally paid. One possible exception might be made to this by mentioning men's balbriggans at $3.50 to $3.75. We understand that there are a few manufacturers who are in a position to take orders on this class of goods at very slight advances, and can promise fairly prompt deliveries. The reason for this probably lies in the fact that the use of mesh and nainsook goods both in two piece and combination suits have cut into the balbriggan business to some extent.

Ladies' low priced straight ribbed vests are scarce and some of the mills that have a reputation for being prompt on deliveries are this season causing their customers considerable annoyance. Mills like the Amazon Knitting Co. and Southdown Knitting Co. are reported to be from 40 to 60 days behind on their orders.

The situation on ladies' light weight shaped goods is much the same and we hear many buyers complaining bitterly of the deliveries they are receiving from such mills as The Gotham, Hazle, Roulette and others.

We are informed that the Royal Gem Mills are planning to put a line of light weight shaped goods on the market for 1910 and are figuring on a large production at about $1.80 to $1.90 for vests and pants, and $3.25 to $3.50 for combination suits. There seems to be a general impression that there is an opening for manufacturers on this class of merchandise.

It is noticed in many localities that shaped goods, running from 3 1/2 to 4 pounds in weight are being sold nearly every month in the year and there has been a shortage of desirable lines the past two seasons to take care of this increased business.

The tremendous increase in the demand for combination suits does not seem to affect the manufacturers of ladies' two piece suits as much as it does those manufacturers who make men's balbriggans, but this is probably caused by the same manufacturers who have been making ladies' ribbed vests and pants, turning part of their production to suits.

The Atlas Underwear Co. of Piqua, manufacturers of men's union suits, are unable to take care of all of the business being offered to them during the past two seasons, owing to their inability to get sufficient help in Piqua, and the stockholders are planning to erect another plant in Richmond, Ind., to make a similar class of merchandise and with which to cater to the same trade

Manufacturers of all lines of heavy weight underwear appear to be well supplied with orders and from all we can learn, the retailers have placed their orders early with the jobbers and in good volume, not sufficient, however, to cause any heavy duplicating in the primary market as yet.

Some buyers are holding off with the expectation of getting lower prices when the new cotton crop begins to make itself felt, but up to the present time, we can see no indication of lower prices and would suggest to buyers who would have their goods to deliver when the season comes, the necessity of getting their orders fully placed.

It is claimed by many manufacturers that

the greater part of the merchandise that has so far been sold has been based on raw cotton at 12 1/2 to 13 cents and that even though the present price dropped 2 cents a pound, it would not have the effect of altering the price of merchandise.

Wool lines seem to be in a well sold up condition and a number of manufacturers of this class of goods report that they have sufficient business to keep them busy until well into October. We do not learn of any changes being made in the prices of wool lines; in fact, these manufacturers usually make a price at the beginning of the season and are in a position to carry it through to the end, regardless of raw material changes.

Up to the present writing, no spring lines of underwear have been shown. We understand, however, that a number of manufacturers have their samples made up and while it was thought last month that the opening would occur rather late, we are assured that several manufacturers will be soliciting business by May 15th to 20th.

HOSIERY.

The hosiery business, as reported by jobber and retailer, is unusually quiet for this time of the year, and no well defined reason for this state of affairs can be learned from them. Notwithstanding this, the manufacturers of hosiery are well employed and it is very difficult to get any duplicate orders on any class of hosiery filled in a short space of time.

Many manufacturers have their entire production sold for the first six months of the year and are unable to care for any duplicate business, while others require at least four weeks to fill such orders.

The Philadelphia strike has seriously handicapped deliveries this spring and it will require some time for manufacturers to get caught up with their deliveries. Jobbers in the meantime have to pay the penalty of the go-between position which they hold between retailer and manufacturer.

There is not enough colored goods to be had in either women's or children's, and delivery of these is exceedingly slow.

The part silk seamless stocking for women to retail at 50 cents a pair met with instant favor and the demand at present is considerably greater than the supply. There is room for other manufacturers to sell a big quantity of this class of hose.

There has been a slight break in the prices of low grade cotton hosiery and while it has not been general by any means, it would seem to indicate that slightly lower prices will be in force later in the season, and slight concessions are now made by some manufacturers in order to secure business for fall delivery. We find women's full seamless cotton, weighing 1 lb. 8 oz. quoted at 70 cents and the same kind, weighing 1 lb. 12 oz. at 75 cents. These prices are lower than those at which goods of equal value could have been bought at a month ago.

A matter of some concern to manufacturers at the present time, as the season for making prices for next spring becomes imminent, is to determine on what basis to make their prices, and many admit frankly and openly that they will be at a total loss to know how to do this and that they will be obliged to gamble to a large extent.

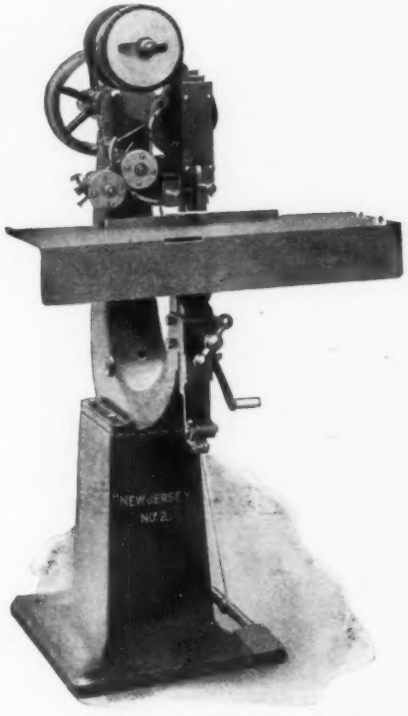
The lines, of course, will have to be opened as usual, for in no other way could the samples for the jobbers be made so as to be ready at the necessary time, and it would not be surprising, judging from what we have heard, to find many prices based on cotton costing about 9 cents which was also about the basis of prices for spring, 1910.

Chemnitz, Germany, reports that the hosiery business there is very slow, practically at a standstill, and that the American buyers now there are placing only very light orders and that even very low prices fail to induce them to buy large quantities of any kind of hosiery.

About the early part of March, conditions there improved so very much so as to be termed a boom, but it quickly passed away and left the market duller than before. The prices, it is reported, cannot be reduced while the high cost of yarns continues, but even when old prices are quoted for stock lots, they find no takers. Manufacturers in Germany are working on their new lines for the spring of 1911, but it is too early to make any predictions as to what these lines will consist of or what will be new or popular.

THE "NEW JERSEY" WIRE STITCHING MACHINE.

For many years the "New Jersey" wire stitcher has been well known to the printers' trade. The demand for such a machine adapted for attaching labels to hosiery and knit goods, has led the manufacturers to offer this machine to the textile trade. A number of leading firms in and near Philadelphia are now using the "New Jersey." A point of special value is found in the extra large space between the working parts and



THE " NEW JERSEY " WIRE STITCHER.

operating table, allowing easy, safe and rapid handling of the goods. The speed of the machine is limited only by the skill of the operator. Thin wire is used, thread from spools, the machine making and driving pointed staples automatically without injury to the goods. The machine is equipped for electric motor, belt or foot power.

J. L. Shoemaker & Company, 15 South 6th St., Philadelphia, are the sole agents to whom inquiries for catalogues, samples of work, etc., should be sent.

IMPROVEMENT FOR THE BANNER KNITTER.

The Hemphill Mfg. Co., Pawtucket, R. I., builders of the Banner full automatic knitting machine, have recently brought out an attachment which commends itself at once to knitters of ladies' hosiery. The device cuts the thread on the completion of the leg, allowing the stocking to drop without stopping the machine, which goes on with its work without interruption. It is simple and is easily attached to the machine. All their machines are now equipped with them.

REINFORCING HOSIERY.

Editor Textile World Record:

What is the best kind of yarn for reinforcing the heel and toe of hosiery? Parkville (1183).

There is a difference of opinion as regards the merits of the various yarns used for reinforcing. The yarns most generally used for splicing have been the soft twist single carded and combed peelers. Until recently there was but very little 2-ply or linen yarn used owing to the difficulty the manufacturers had in running them. In recent years the machine builders have succeeded in perfecting yarn splicing attachments which make the successful use of 2-ply and linen splicing yarn possible, with the result that the leading manufacturers are putting in 2-ply and linen splicing in most of their high grade goods. Especially is this true in the guaranteed brands. As to the merits of the various kinds of splicing yarns, there can be no doubt but what the linen comes first. This yarn is the most difficult to use successfully and the percentage of seconds will run considerably higher by its use, unless the machines are equipped with the latest improvements.

Next to the linen yarn in strength and wearing qualities is the 2-ply sea island mercerized. This yarn is regarded by many to be superior to linen for splicing yarn and is much more easily worked. However, by actual test it has been found to lack the

wearing qualities of the linen. There does not seem to be much difference in the actual wearing qualities of the 2-ply combed Egyptian and the 2-ply combed peeler yarns for splicing. Both are used considerably. If the goods are made entirely from combed Egyptian stock a combed Egyptian splicing yarn should be used, and if the goods are made from combed peeler stock a combed peeler splicing yarn should be used.

The single carded peeler and combed peeler are used only in the cheaper grades, there being but little difference in the wearing qualities. It has also been found that a 2-ply splicing yarn or linen splicing when used in goods made from single thread stock or two single threads, does not give as good satisfaction as the single carded or combed peeler splicers, owing to the fact that the hard twist yarns have a tendency to cut through the single or soft twist stock. The same trouble is also apparent when a single soft twist splicing yarn is used in goods made from 2 or 3-ply lisle yarn. Especially is this true where the heels and toes are knit exceptionally tight. For these reasons I have found that in 2-ply lisle or mercerized goods, the best results from a wearing standpoint are obtained by using linen splicing in the lisle goods and by using 2-ply sea island splicing in the mercerized goods, and using single heavy soft twist splicing in the cheaper or single thread goods.

Merrill.

KNITTING NECKTIES.

BY LARAMIE.

Firms that are now making knit neckties are using two feeds on nearly all the work, as it not only doubles the production but gives a wider range of patterns and styles to work with than can be obtained with a single feed.

FIG. 1.

FIG. 2.

Fig. 1 is a very pleasing effect in a tuck stitch knit on two feeds and using a wheel cut one and one, except in one place where one slot is not cut. This leaves three needles which are constantly working the plain stitch. As the cylinder is cut for an odd number of needles it gives a diagonal effect on the plain stitch. This wheel is placed so as to work on one feed and the other feed works plain without a wheel.

Fig. 2 is a very attractive pattern for a striped tie, made on two feeds with a wheel on one feed cut one and one all around.

The cylinder has an off number of needles which gives the tuck stitch effect. When

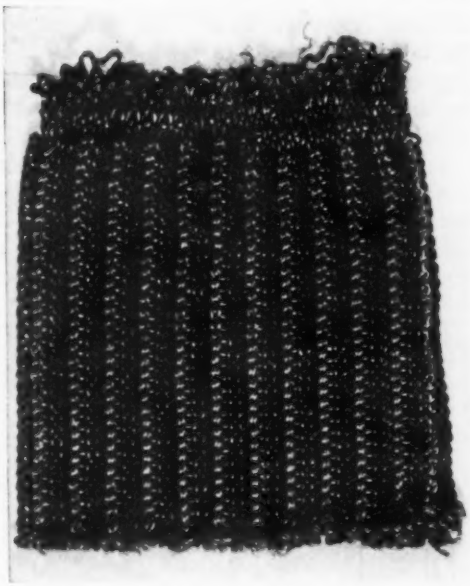


FIG. 3.

one thread of colored silk is not working the white silk or stripe goes in, which produces a stripe of two colors. The second feed, which is a plain feed without a wheel, runs the colored silk continuously into the tie.

Fig. 3 shows a tie which has a wide vertical stripe down the front, making a very pleasing effect. This pattern is made on two feeds, but no wheels are used. The cylinder has a long latch needle alternating with a short latch needle except at two places where, instead of two long latch needles, there are two short latch needles. Two colors of silk are used, one feed casting off the long latch needles, and the other feed the short latch needles. Whichever color is desired for the stripe must go into the feed which casts off the long latch needles, because then the five short latch needles which comprise the stripe cast off only at the highest cam.

Fig. 4 is a raised effect tie made in plain colors only on a cylinder with an odd number of needles and using a wheel which is cut two and two and is used on one feed only, the other feed working plain. This wheel, cut two and two, gives the effect of two tuck stitches alternate with two plain stitches.

Fig. 5 is a very attractive tie showing a stripe on both sides, but using silk of only one color in both feeds. The cylinder for this tie will have all long latch needles except where seven short latch needles are

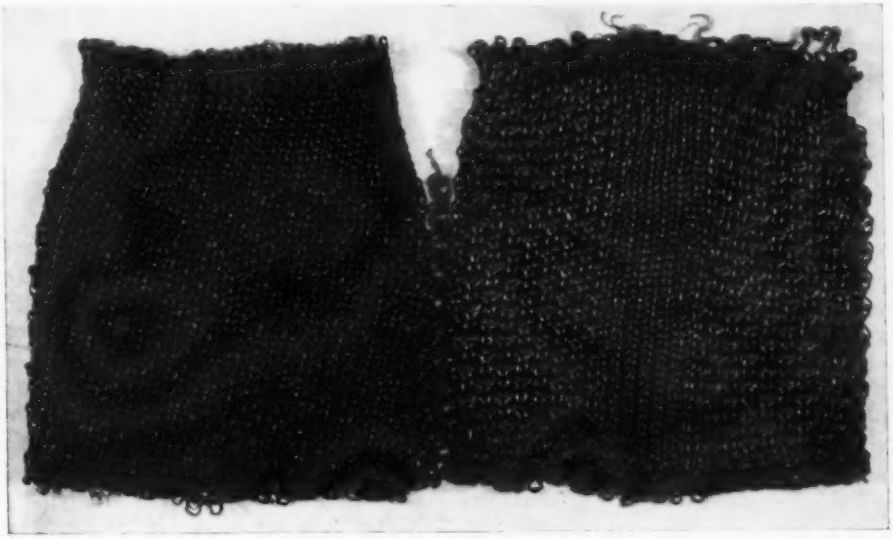


FIG. 4. FIG. 5.

used instead. A wheel cut one and one is used which gives the tuck stitch on all the long latch needles, and plain knitting on the short latch needles.

A CIRCULAR KNITTING MACHINE.

Improvements to circular machines for knitting hosiery have recently been patented and are described as follows: The object is to increase the production of and improve the quality of the goods produced by a tubular hosiery knitting machine. One of the principal features is that the machine is provided with two sets of knitting cams arranged to form two knitting waves which follow each other about the circular series of needles during rotary knitting. One set of cams is mounted and arranged so that it may be rendered inactive during the knitting of the heel or toe. A yarn feed corresponding to each set of knitting cams is provided so that during rotary knitting two yarns are knit in two continuous parallel spiral courses to form the leg or foot of the stocking. The effect of any inequalities in size or character of different parts of each yarn are neutralized to a great extent and a fabric is produced which is more uniform in appearance and texture and more agreeable to the touch than is produced by machines which knit a single yarn in a single continuous spiral course. Not only is a better and more uniform fabric produced, but that part of the fabric which is knit during rotary knitting is produced in one-half the time without any increase in the speed at which the machine is run.

Further features of the invention contemplate the automatic operation and control of one set of knitting cams so that it will be automatically thrown out of operation or rendered inactive when the relative motion between the needles and cams is changed from rotary to reciprocating in going on to the heel or toe, and will be again automatically thrown into operation or rendered active when the motion is changed from reciprocating to rotary after the heel or toe has been completed.

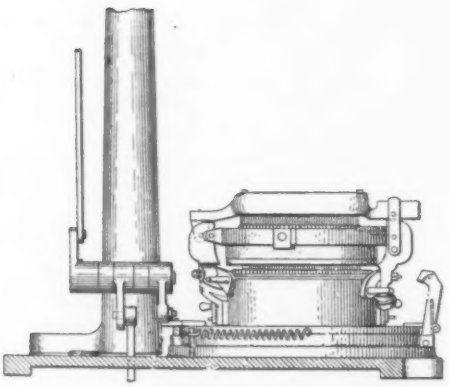


FIG. 1.

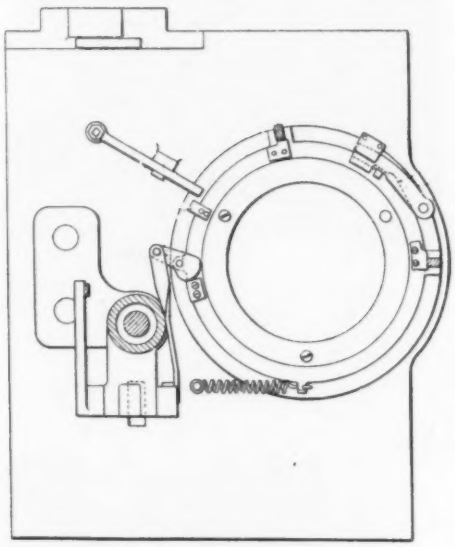


FIG. 2.

The improved features may be embodied in various forms of circular knitting machines. For the purpose of illustration they are shown in the accompanying drawings in a machine similar to the Mayo type.

Fig. 1 is an elevation of the head of a knitting machine equipped with the improved device; Fig. 2 is a partial plan view; Figs. 3 and 4 are views showing develop-

ments of the inside and outside of the cam cylinder respectively; Figs. 5 and 6 are sections on lines 5—5 and 6—6 respectively of Fig. 3.

In the machine illustrated in the drawings, the devices for effecting the narrowing and widening, the means for throwing the needles not used during the narrowing and widening out of operation at the beginning of the heel or toe and returning them into operation at the completion of the heel or toe, and the mechanism for changing the motion of the cam cylinder from rotary to reciprocating and from reciprocating to rotary, are substantially the same as the corresponding mechanisms and devices in the Mayo machine. The needle cylinder is the same in construction as the needle cylinder of the Mayo machine, and is supported in the same manner. Those needles which are not used during the formation of the heel and toe are provided with long butts, while the needles which are used during the knitting of the heel and toe are provided with short butts, as is common in this type of machine.

FIG. 3.

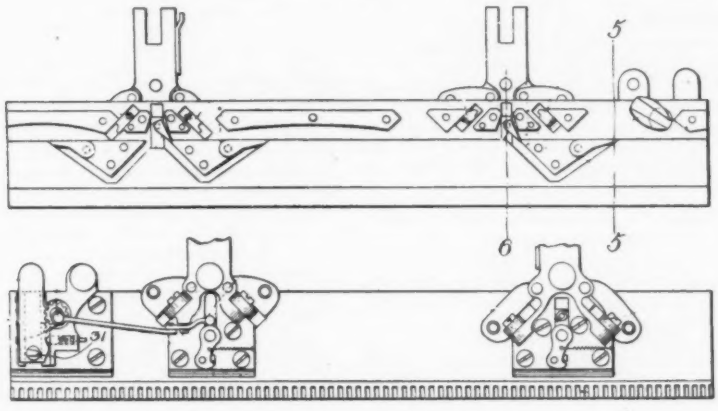


FIG. 4.

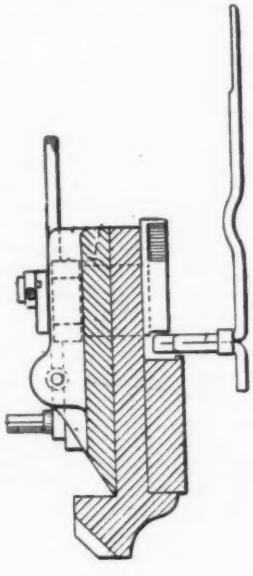


FIG. 5.

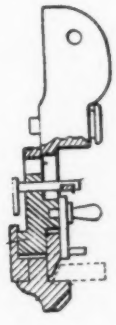


FIG. 6.

The total imports of raw wool for the year ending December, 1909, amounted to 312,131,171 pounds, valued at $55,530,366, as compared with 142,559,384 pounds, valued at $23,304,465, imported in 1908.

The number of goats in Asia Minor is estimated at 3,000,000 and the value of the mohair annually produced is placed at nearly $4,000,000.

The total imports of wool manufacturers, amounting to $18,048,403 (foreign- valuation) entered for consumption into the United States show a decrease of $1,053,880. Cloths show a small increase of $154,685.

KNITTING MILL NEWS.

New Mills.

*Canada, Quebec, Shawinigan Falls. The initial equipment of the Shawinigan Cotton Co., Ltd., will be 10,000 spindles for making hosiery yarns and a knitting department. J. N. Greenshields is president; L. G. Craig, treasurer; C. R. Whitehead, general manager, and K. Harvey, manager of knitting department.

*Georgia, Columbus. Henry Spang will devote all his time to the organization of the new hosiery company in which he is interested. Mr. Spang was formerly general manager of the Topsy Hosiery Mills, but withdrew when the plant was secured by J. D. Massey and others. He proposes to organize a $100,000 company and to locate in Columbus.

*Georgia, Douglasville. The Douglasville Knitting Co. has begun manufacturing on a few machines and if they find a good salable product can be made, several new knitting machines will be added in a short time. J. T. Duncan of Douglasville heads this company.

Indiana, Richmond. L. M. Flesh, E. A. Todd and H. E. Sims, president, treasurer and secretary, respectively, of the Atlas Underwear Co., Piqua, Ohio, are in communication with the Commercial Club and Young Men's Business Club of this city in regard to the location of an underwear mill here. A bonus of $14,000 is offered for a company which will build and operate a $100,000 underwear plant. Mr. Flesh is quoted as saying the new company, if formed, will be entirely separate from the Atlas Underwear Co., but will manufacture a similar line of goods. The proposed plant will be 5 stories high with electric power equipment.

*Louisiana, New Orleans. The National Hosiery Mills, reported incorporated last week with capital stock of $50,000, have organized with Erhard Mayer, president; Wm. Mayer, vice-president; Isadore Mayer, secretary, and Albert Mayer, treasurer. The company is located at Chartres St. and Lafayette Ave. and will install knitting machines, dyeing and finishing equipment, to be driven by electricity. The daily output will be from 100 to 125 dozen hosiery. The knitting equipment has been ordered, but no arrangements made for other equipment.

*Massachusetts, Northampton. It is proposed to incorporate the new silk hosiery company with capital stock of $250,000. The plant will probably be located at Northampton, although a Florence site has been considered and Holyoke has made a bid for the industry. As noted previously, D. D. Evans of Springfield heads this project.

New Jersey, Passaic. The Passaic Knitting Works have bought 18,000 sq. ft. of land in Garfield on which they will erect a mill for manufacturing bathing suits and sweater coats. The capital stock of the Passaic Knitting Works is $25,000. They are now located at 11 Monroe St., Passaic, and manufacture knitted jackets for men, women and boys on 15 knitting and 7 sewing machines. Frank Bauer is president, buyer and superintendent.

New York, Milton. C. F. Hoag Co., who operate the Lindenwald Mills at Poughkeepsie, are starting a branch knitting plant here and will specialize in the manufacture of gloves. The initial equipment is to be 40 knitting machines. According to present plans, manufacturing will be started about May 1 with 42 to 50 hands. The plant is to be operated by electric power. This is simply a branch of the main mill at Poughkeepsie and all buying will be attended to at the main mill. C. F. Hoag is president and Asa Hoag is treasurer.

*New York, Utica. The Imperial Textile Co., incorporated in February with capital stock of $15,000, will begin manufacturing about May 1 at 14 Elizabeth St. with 17 hosiery machines, 4 underwear machines and 10 sewing machines. Children's underwear and hosiery will be the sole output. The officers are A. F. Spitzli, president; Henry M. Love, treasurer, and Wm. F. Warner, superintendent. Mr. Spitzli will attend to the buying.

New York, Utica. Another new company is locating in the Williams Building on Blandina St., and will operate under the style of the Walnott Knitting Co. M. A. Wald will be president; John J. Sinnott, treasurer, and John E. Crotty, superintendent and buyer. The company has capital stock of $20,000 and will make infants' vests on 10 interlock machines and 20 sewing machines. They will probably have a selling agent, although this matter has not been decided upon. The work of equipping the plant is being rushed so that manufacturing may be started early in May.

*North Carolina, Cooleemee. The North Cooleemee Hosiery Co., recently incorporated with capital stock of $20,000, will award contract to a Cooleemee firm for the erection of a 40 by 100-foot building of brick construction with metal roof, and install knitting machinery, with steam power, plant to employ 50 to 60 operatives. The company has organized with C. P. Readman, president; J. M. Granger, vice-president, both of Cooleemee, and J. M. Greenfield of Kernersville, N. C., secretary and treasurer. Mr. Greenfield has a plant of 24 knitting machines at Kernersville, which has been idle for some time, and it is probable he will move this machinery to Cooleemee.

*Oklahoma, Frederick. The Frederick Knitting Mill has awarded contract to P. T. Tarwater of Frederick for the erection of a 2-story building, 50 by 150 ft. When completed the building will be equipped with hosiery machinery. As noted previously, this company has capital stock of $100,000 and is headed by J. W. Blackwelder of Hickory, N. C.

*Pennsylvania, Easton. The Easton Knitting Mills Co. has been granted a charter with capital stock of $10,000. As noted previously, a mill is being built on Packer St. on the south side, and will be equipped for the manufacture of men's,

women's and infants' hosiery. Details of equipment and officers have been given previously.

*Pennsylvania, Hazleton. A new concern to be known as the Hazleton Hosiery Co. is building a mill here for the manufacture of hosiery. The capital stock will be $25,000. W. H. Davies will be president and T. A. Williams, treasurer. Details of machinery equipment have not been worked out, but it has been decided to operate by electric power. D. J. Roderick and other citizens are interested.

*Pennsylvania, Lebanon. H. K. Dietz, formerly connected with Nolde & Horst Co. of Reading, Pa., has started a small plant here for the manufacture of 240-needle half hose, installing 20 machines.

*Pennsylvania, New Berlin. Favorable arrangements have been made by the town with Lewis Lesher of Lansford for the location of a hosiery mill here, and construction work will be started April 18 on a building to be equipped with 40 knitting machines for making men's and women's hosiery. The new concern will be known as L. Lesher & Son. Lewis Lesher will be president, treasurer and attend to the buying. According to present plans, manufacturing will be started June 1.

*Pennsylvania, Philadelphia. The Universal Hosiery Co., who recently received their charter and leased floor space in the mill at 2d and Norris Sts., have increased their capital to $100,000 and elected the following officers: Morris Bernheimer, pres.; George Dies, vice-president; William Schaenher, secretary, manager and buyer; John Kessel, treasurer, and F. L. Strauss, superintendent. The plant is being equipped with 7 full fashioned machines, 24 ribbers, 5 loopers and 5 seamers, which will be operated on ladies' fine gauge silk lisle and lisle full fashioned hosiery and children's ribbed full fashioned hosiery, which they will finish and sell direct. They will buy 2/34 to 70 mercerized, 1/18 to 70 combed Peeler and 2/30 to 60 lisle yarns.

Pennsylvania, Philadelphia. William Smith has leased the second floor of the two-story building at 243 E. Ontario St., and has installed 5 knitting machines. He will manufacture sweater coats and fancy knit goods by hand and electric power and sell the production direct.

*Pennsylvania, Reading. The new Berks Knitting Co. will be located at 3d and Bern Sts. As noted, the capital stock will be $50,000. O. B. Wetherhold will be president and W. R. Wetherhold, treasurer and buyer.

*Pennsylvania, Strausstown. Work has just been started on building for the new hosiery company, which will be known as Herbein & Anthony. They propose to begin manufacturing about June 1, making 176-needle men's and women's hosiery, giving employment to about 25 hands. Details of equipment have not been fully worked out, but the plant will be operated by steam power. Men interested are Dr. O. B. Herbein and H. W. Anthony. Communications should be addressed to Herbein & Anthony, Strausstown, Pa.

*Pennsylvania, Wilkesbarre. W. S. Marshall & Co., owners of the new hosiery mill, have 16 knitting machines and 2 sewing machines on which they are manufacturing men's and women's hosiery, using 14s and 16s mule spun yarns on cones. W. S. Marshall is president and treasurer, and L. I. Hohl is treasurer and buyer. The plant is operated by steam power.

Tennessee, Cleveland. The mill being built for the new Weiss Hosiery Mill is nearly completed. It is a 50 by 160-foot structure with separate engine and boiler house. About 50 knitting machines will be installed and an 80-h. p. steam power plant. C. H. Weiss is president and superintendent. This company was organized last November with capital stock of $25,000.

*Tennessee, Knoxville. Machinery is being installed by the new Appalachian Mills. Full particulars of this company have been given.

*Wisconsin, Appleton. The new knitting plant at 549 Walnut St. is owned by H. F. Bach, who is operating under the name of the Imperial Knitting Works. Sweater coats and home knit stockings are made on 4 flat knitting machines and 4 sewing machines, giving employment to 6 hands. Mr. Bach buys 2/20s and 2/22s wool and 2/16s and 3/20s worsted yarns.

Enlargements and Improvements.

Alabama, Alexander City. It is reported the Russell Mfg. Co., Inc., is considering the construction of a water-power-electric plant. This is a knit underwear manufacturing concern which operates 2,700 spindles, 36 latch needle knitting machines and 35 sewing machines, bleaching and finishing the goods.

*Georgia, Columbus. In about thirty days a charter will be secured for the Massey Hosiery Mills with capital stock of about $150,000. The officers will be C. L. Perkins, president; R. C. Jordan, vice-president; J. D. Massey, secretary and treasurer. These men with G. Gunby Jordan, president of the Eagle & Phenix Mills, bought the Topsy Hosiery Mills from Ely & Walker Dry Goods Co. several weeks ago and will increase the capacity of the plant about 50 per cent., the addition consisting mainly of knitting machines. The present equipment is 200 knitting machines. The property is estimated now to be worth about $125,000. Mr. Massey is treasurer of the Eagle & Phenix Mills, and secretary and treasurer of the Perkins Hosiery Mills. Mr. Perkins and Mr. R. C. Jordan are president and vice-president, respectively, of the Perkins Hosiery Mills.

*Georgia, Rome. Twenty-five knitting machines will comprise the new equipment to be installed in the Rome Hosiery Mills. Particulars of their enlargements have been given previously.

Illinois, Chicago. The Lorenz Knit Goods Mfg. Co., 1754-65 Belmont Ave., has increased its capital stock from $50,000 to $125,000, and will increase the equipment. Richard Lorenz is president, superintendent and buyer, and Max Schlosser is superintendent.

Dyeing, Bleaching, Printing, Etc.

SPONTANEOUS COMBUSTION.

LOUIS J. MATOS, PH.D.

The spontaneous ignition of textile fibers in the mill has always been a source of latent danger and hardly a year passes but that there are a number of more or less disagreeable fires which have been traced, or at least credited, to this somewhat obscure cause.

Spontaneous combustion of organic matter has been found to be due to certain chemical and physical properties of some substances which permit the condensation of both moisture and gases upon the substance itself, and the chemical properties of the gas determines in a measure the amount of it condensed, and which, further, is controlled by the mechanical division of the absorbing substances. As a general rule, oxygen from the air is the gas most commonly condensed and absorbed, and if this condensation takes place under conditions where conductivity of heat is poor, heat will naturally accumulate, with the result that the organic matter will suddenly unite with the condensed oxygen and result in "spontaneous combustion."

It is a well known fact that certain oils are more liable to spontaneous ignition than others, it being particularly well known to textile manufacturers that when scoured wool has been oiled in the picker house in the usual manner and under parallel conditions of storage, time and temperature, but one batch with say cottonseed oil and another with an oleine, the former will more rapidly attain a higher temperature. Of all the more commonly used oils, cotton oil is the one most liable to induce spontaneous ignition, and is due to the fact that where applied to the fibers it naturally forms a very thin coating or film on their surface, and this extremely thin body of oil gradually takes up oxygen, at the same time emitting heat which in turn causes the ignition.

It should be remembered at all times that the ignition or inflaming of any organic substance is always due to the oxidation of carbon, the carbon being the principal constituent of all organic substances, whether it be wood or animal fibers, cotton, or oils, etc. The oxygen is obtained almost invariably from the atmosphere, the composition of which is one-fifth oxygen and four-fifths nitrogen, this latter being a gas which retards or prevents combustion.

Wherever oxygen and a readily oxidizable organic compound are brought together spontaneous ignition takes place, and which is easily demonstrated by means of the very simple experiment of the lecture table. If we take a jar containing oxygen gas and suspend in it a piece of blotting paper soaked in oil of turpentine (a readily oxidizable substance), a more or less energetic union takes place between the two substances, during which a rise in temperature occurs to such a point that the oxygenized product of the turpentine bursts into flame in the presence of the unconsumed excess of oxygen.

Let us now consider the bearing that this interesting experiment has on our work in a cotton or woolen mill. Raw wool as it leaves the washers is dried, as a rule, on wire nets through which air is forced previously heated by passing around steam coils. In many mills these driers are of the open (unenclosed) form, the spreading of the wet wool being done by hand. Generally the dry-room is equipped with a large exhaust fan, which ensures a more or less complete removal of the warm and saturated vapors and where the ingress and egress is properly regulated, spontaneous ignition seldom or never occurs. It is very doubtful if absolutely clean fiber will ignite spontaneously unless superheated and before cooling, a current of cold, fresh air is permited to strike it. Under such conditions, where incipient charring has occurred to a partial destructive distillation of the fiber, inflaming may follow.

In the ordinary course of drying raw stock, the temperature of the dry-room or chamber seldom becomes overheated except

through carelessness, in which latter case it is always the lurking element of danger. It sometimes occurs that the cause of spontaneous ignition may be traced to the coloring matters employed in dyeing, but experiments conducted with sufficient accuracy to warrant an opinion on this point have not been made. It seems very doubtful, however, that a dyestuff per se can be responsible for any such damage.

Some time ago, the tendency of cotton, prepared with acetate of lead or when dyed a chrome orange, as in the manufacture of braids for pocket cigar lighters, was very liable to ignite. It has also been noticed that the lead lakes of eosine, when deposited upon vegetable fibers appear to facilitate the ignition of the fiber mass.

Instances have been enumerated where dyed raw wool, during the process of drying, have suffered ignition, but investigation has failed to connect the ignition with the dyestuff, but, on the other hand, everything pointed to the presence of oily matters permanently adhering to the wool fibers. One of the familiar instances of spontaneous ignition is that developed during the oxidation of aniline black on cotton, but this is rather due to the nature of the dyeing process than to the "dyestuffs."

The proper discussion of the problem of spontaneous combustion of dyed material is extremely difficult for two reasons; first, the literature of the subject is practically barren in so far as having any bearing upon the textile industry, and second, personal requests to manufacturers and others fail to bring out the results of their investigations of the cause of such fires occurring in their mill.

Some years ago, a case was brought to the writer's attention in which, it was said, a certain drum of dyestuff was "smouldering" in the dyer's drug-room, and the conclusion arrived at in the mill was that all fabrics dyed with this particular coloring matter would, in like manner, ignite and smoulder. However, thorough investigation on the premises developed the fact that the dyestuff was not smouldering—nor had it been—but that it had become moist through slowly falling, but steadily, drops of water from a defective roof, the result being that heat of chemical action was given off. Trials were subsequently made to set up the same action on fresh quantities of the same dyestuff, with the uniform result that while heat was generated, the rise in temperature was far below that required to ignite. It was an analogous case to those instances where water and oil of vitriol are mixed.

As most cases of spontaneous combustion in mills are located in the raw stock, and especially after drying, it is natural to give our greatest attention to the conditions surrounding the drying. The general opinion is that where the volume of heated air is sufficient to carry off completely the amount of moisture taken up from the wet stock, at a sufficiently rapid rate and at a given temperature short of carbonizing the stock, the possibility of ignition is eliminated. It is presumed that under such conditions the stock is clean and free from both oxidizable and extraneous oxidizing agents.

Experiments with dyed raw wool and cotton are now in progress with the view to ascertaining the probable cause of such material ignited, and due regard is also being paid to the presence of sparks from metal parts and also to the influence of electricity.

SODA ASH AND OTHER FORMS OF ALKALI IN TEXTILE INDUSTRIES.

BY FRANCIS C. WARE.

Few people realize how wide is the range of usefulness of the alkalies in the manufacture of textiles, extending as it does from the first boiling-off operation to the final finishing and softening process, and including, directly or indirectly, nearly every intermediate treatment.

The alkalies used are soda ash, the anhydrous normal carbonate of soda; sal soda, the normal carbonate crystallized with ten molecules of water; caustic soda; monohydrate crystals, a definite hydrate of normal sodium carbonate crystallizing with one molecule of water; Snow Flake crystals, a definite product consisting of normal sodium carbonate and sodium bicarbonate in chemi-

cal combination; lime; ammonia; baryta, and mixtures, or successive treatments.

Owing to the careless use of the terms soda and soda lye by some writers confusion has resulted, these names being correctly applied only to solutions of the normal carbonate; caustic soda being indicated by the prefix caustic.

Thanks to modern methods of manufacture the alkalies now on the market are of high quality, commercial soda ash testing 98.5 per cent. normal carbonate or better; and those products such as monohydrate crystals, Snow Flake crystals and caustic soda, which are derived from soda ash, showed a corresponding purity.

For successful work, the strength of all baths should be standardized, and to accomplish this the best procedure is to use the definite compounds soda ash, monohydrate or Snow Flake, rather than the partly dehydrated and indefinite sal soda. By this procedure a saving is made in bulk, and cost of shipping, since sal soda contains 61.8 per cent. by weight of water, whereas monohydrate contains but 14.4 per cent. and Snow Flake but 15.8 per cent.

Monohydrate then can be used for the preparation of all soda lyes, and Snow Flake, being less caustic than soda ash, is especially fitted for scouring wool fabrics where a soft effect is desired.

For the sake of simplicity the uses of the alkalies may be divided into three classes: (1) direct, (2) indirect, (3) analytical. The present article deals with the first class, although mention is made of the other classes to give an idea of their scope. By direct is understood the actual treatment of the fiber or textile product with some form of alkali or alkaline product capable of giving the same result. By indirect, the preparation of some article which is used in textile manufacture.

By analytical is meant the use of caustic soda, caustic potash, ammonia, etc., in the preparation of reagents by means of which one fiber is distinguished from another. Such reagents are 1 and 10 per cent. solutions of caustic potash. Schweitzer's reagent containing ammoniacal cupric oxide prepared with caustic soda; Lassaigne's reagent containing caustic soda; Liebermann's reagent containing ammonia; Loewe's reagent containing caustic soda; Richardson's reagent prepared with caustic soda and containing ammonia; Nitroprusside solution, free acid neutralized with carbonate of soda.

Some of the uses for alkalies in class 2 are: The preparation of sodium tungstate, used for fireproofing; sodium silicate, used for fireproofing and for boiling-off cotton before mercerizing; starch by the "sweet process," used for sizing, finishing and dyeing; glucose, made from starch; glycerine, by the saponification of animal fat; dextrin, by the action of acids on starch; dextrin substitutes, by the action of caustic soda on starch; indigo and alizarine; resin lye; bleaching powder and solium hypochlorite; ultramarine; gelatin, by Nelson's process; water softening; cane sugar; Prussian blue; Alkali blue; casein; glue; manufacture of dyes; and soap. This last substance also belongs to class 1 in that it is applied either with, or as a substitute for alkalies, acting in the same way, but without injury to the more delicate fabrics.

Alkalies, as included in class 1, are used to free the raw fibers from waxy, gummy and pectic matters, the concentration, temperature and choice of reagent depending on the fiber to be treated and the result desired. A good example of graded application is in the preparation of cuit, souple and ecru silk. For the former a solution of 10 to 15 grams of neutral, olive oil soap is used and the sericin completely removed. For the others the treatment is milder, the respective products having lost 8 to 10 per cent. and 3 to 4 per cent. of their gum. For the cheaper silks soap and soda, or even soda alone are used.

For washing raw wool, soap and soda are used; soap alone for worsteds, and soda alone for fine carding wools, since the latter are very difficult to cleanse. It is in such processes as this that the use of Snow Flake crystals find application, being more certain

in its action than soap, without giving the harshness due to soda.

More active alkalies, such as caustic soda, readily dissolve wool at slightly elevated temperatures; a property which makes possible the preparation of animalized cotton for dyeing purposes by immersing cotton in a solution of wool in caustic soda.

With caustic solutions of 80° Tw. a temperature of 20° C. or less, and immersion of five minutes, an action similar to mercerization takes place, giving a product with increased tensile strength, high luster and silk scroop.

In mercerizing cotton it is essential that tension be applied transversely as well as horizontally, that the tension be applied before and during washing, and that air be excluded if raised temperatures are used, as otherwise oxycellulose results instead of hydrocellulose. Caustic alkalies should not be used to bleach cotton which is to be mercerized. Turkey red oil, sodium silicate and soap being better designed to obtain a uniform result.

The best results are obtained with a caustic solution of 55° to 60° Tw. (1.3 Sp. Gr.) at 65° F. Uniform impregnation is assisted by the addition of alcohol and glycerol to the extent of 5 per cent. on the weight of the goods. Increased luster is obtained by the cautious use of carbon bisulphide. Good results have been obtained with a temperature of 90° C., but in this case air must be excluded and the fabric kept immersed.

Of the other direct uses for alkalies, some of the most important are: For bleaching cotton, in which process the Theis and Herzig method employing caustic soda is considered the best; as an ingredient in many dye baths, for which soda ash is used; for removing the acid used in the recovery of shoddy, mungo and extract, and for the removal of acids in general after treatment of the goods in a scouring bath, the alkali used being soda; for production of CO_2 for use in connection with sodium hypochlorite in the bleaching chamber during the chemicking process, bicarbonate of soda being most efficient; for preparing absorbent cotton and cotton batting; for the preparation of viscose by treatment of cellulose in caustic soda and solution in carbon bisulphide; for the preparation of Pauly silk by treatment of cellulose with caustic soda, ammonia and ammoniacal copper oxide; for the preparation of Willesden canvas (waterproof) by the same process with the addition of a final hot pressing; for the neutralization of alum mordant baths; for scouring flax, ramie and the cheaper fibers, caustic soda being in general use except in special cases such as jute, which must be boiled off with sodium silicate of borax.

The use of alkalies may be summarized, then, as follows: Soap, turkey red oil, sodium tungstate, sodium silicate and borax are used for the more delicate fabrics, or those dyed with colors which are not fast to alkalies. Soda, monohydrate, Snow Flake and potash are used for the more vigorous cleansing of less perishable fabrics, which would be injured by caustic alkalies.

Caustic soda and caustic potash are used in dilute solutions under carefully controlled conditions for cleansing and bleaching, and in concentrated solutions for the manufacture of mercerized goods, lustra cellulose and special finishes, such as absorbent and animalized cotton. The use of potash salts, however, is of very limited extent, owing to the high cost.

In classing the uses of alkalies it is evident that those of the first class apply principally to the raw fibers and unbleached, undyed fabrics; whereas those of the second class relate to the final processes of sizing, dyeing, brightening, finishing and weighing.

The exports of raw cotton to Italy since 1880 increased from 59,126 bales to 565,695 bales in 1909.

Not less than 9,000,000 persons are employed in the production, handling and manufacture of American cotton. Of this number, about 6,000,000 are farmers and farm laborers; about 1,000,000 are otherwise engaged, to some extent, with the raw material in the United States; while at least 2,000,000 are concerned with it in foreign countries.

FINISHING WOOLEN GOODS.

BY PINETREE.

The improvement in the woolen goods trade has given the woolen finishers a lot to contend with, as every cut in the finishing room is wanted with a rush, manufacturers striving to keep their stock free from specks and burrs and other foreign material, finishers worrying and scheming how to get the speckers to work in double quick time and the government stepping in and cutting down the production two hours per week. Is it any wonder that woolen finishers turn old before their time? It is not so much the extra work as it is the worry that the goods will not turn out like sample so as to make a good delivery when called for.

My experience has been upon woolens both in Great Britain and in the States and I may be able to drop one or two useful hints to help some struggling brother like myself. Did you ever see the cuts come out of the extractor after scouring to all appearances as if they had been in a snowstorm? I have seen them, not once or twice, but day after day, while the looms were rattling over head producing many more just like them. How is a finisher going to help himself, the firm, and the production? I have found the following method to give good results: Scour the cuts and after drying take them to the napper and run over two or three times with the napping power just as light as possible so as to avoid raising the nap. The specks will then be standing up and many of them quite loose and can be easily picked off with the fingers. When they are pulled up take the cut and run it through the shear, shearing it down even with the cloth to match sample. When it is placed on the specking table it can be cleaned in about half the time it would ordinarily take. After the piece is cleaned run it over with a cleaning brush and then full it. It will be found that the pieces finished in this way will show a great improvement over those finished by the ordinary method.

Every finisher is likely to have a spell of bad work from the looms, it most frequently occurring on heavy picked goods that felt like boards when full of grease. When the goods are in this condition it is almost impossible for the sewers and burlers to do anything with them, and there is great difficulty in burling the knots. The sewers cannot intersect the threads with a needle. This class of goods should be scoured and dried the first thing after coming from the loom, put on the burling table, and then sent to the sewer. In this way the burling and sewing cost should be cut down about one-half. Many finishers make it a practice to full their woolens in the grease. This is a great mistake, as blotchy, cloudy and unnatural looking goods will be the result. The goods should be absolutely clean before fulling and if this is done they will have that clean, lofty and attractive handle that all woolens should have and all dealers look for, and which is impossible to obtain if the goods are fulled in the grease.

Vegetable Dyes.

Editor Textile World Record:

I would like information about the use of primitive dyes like heather, bracken, etc., as used for Harris tweeds and homespuns. Can you put me on the track? Donegal (1171).

A little book on this subject has been compiled for peasant circulation in the West of Ireland by R. P. Milroy. The whole edition is in the hands of the Congested Districts Board, by whose orders it has been printed. The book contains a number of recipes, few of which will be entirely new to practical dyers. The cottage workers are enjoined to use fustic, logwood and madder rather than native plants and roots; the former on the whole giving faster shades. In Ireland, as in Scotland, country people prefer to save trouble by mordanting with copperas in the dye-pot. The pot itself is a round-bellied, three-legged cast iron receptacle holding a very few pounds of wool, and it is swung gypsy-fashion over a turf or wood fire.

Milroy advises the homespun workers to mordant as the first preparation after scouring. Here are some of his formulae for dyeing 100 ounces of wool:

	Mordant.	Dye.
Yellow	5 oz. Alum	80 oz. Heather twigs, leaves or flowers.
Golden Yellow	3 oz. Bichro.	50 oz. Heather twigs, leaves or flowers.
Bluish Tint	5 oz. Alum	50-60 oz. Bracken stems and leaves.

By ringing the changes on madder, fustic and logwood a number of clarets, tans, salmons, greens and lavenders are obtained. Then follow some specimen directions for using native plants.

	Mordant.	Dye.
Black	4 oz. Bichro. Potash	50 oz. Logwood 1 oz. Fustic
Yellow	3 oz. " "	6 oz. Fustic 2 dr. Logwood
Old Gold	3 oz. " "	24 oz. Fustic 4 oz. Madder

Roots of bracken ferns are used to get a yellow shade and the roots and stems of common docks to get a greenish yellow. Brown is procurable by boiling wool for an hour in water strongly tinged with peat-soot, and a little common salt facilitates the operation. A darker brown is obtained by boiling with 50 per cent. of water-lily roots. A black is obtained when this dark brown is reboiled with 50 per cent. of bog ink. Crotal brown shades may be had either from a fustic and madder combination or by using 10 to 50 per cent. of crotal in a slightly acid bath. Urine vats and potash vats are commended for indigo and for scarlet the old cochineal tin crystals and oxalic acid bath is detailed.

Some intention is expressed of following the vegetable recipes with a little book on the use of artificial dyes. This may be taken as a sign that the days of vegetable dyeing in Ireland are numbered. An officer of the Indian Telegraph Department reports that unless binding arrangement is made to the contrary aniline colorings are now regularly used in eastern Persia by native rug makers. The vegetables chiefly employed in the province of Kain are indigo, cochineal and "runas" (a red dye) and "zalir" (a yellow dye). Pomegranate rind, walnut rind, barberry fruit and grape leaves are used to a smaller extent. The Persian mordant is alum used liberally. Wessex.

Dye Recipes

The following recipes appear in the Dyers' Supplement, which is issued each month by the TEXTILE WORLD RECORD. The Supplement contains the colored samples, dyed according to recipes given. The selection of samples is carefully made, and it is the aim to show shades which are of especial interest to the dyer, and which the requirements of the market demand. The Dyers' Supplement is a 16-page pamphlet, in convenient form for preservation. Subscription price for the Dyers' Supplement $1.00 per year.

Recipe No. 65.

Violet on Worsted Yarn.

Fast Acid Violet A on 100 lbs. worsted yarn. Prepare the dye bath with

3 lbs. Fast Acid Violet A.
(C. Bischoff & Co., 451 Washington St., N. Y.)
4 lbs. Sulphuric Acid.
10 lbs. Glauber's Salt.

Enter at 160° F., and dye at a boil for one hour.

Fast Acid Violet A is a very level dyeing color, and may even be entered at a boil if desirable.

Recipe No. 66.

Yellow on Cotton Yarn.

Direct Bright Yellow Conc. on 100 lbs. cotton yarn. Prepare the dye bath with

3 lbs. Direct Bright Yellow Conc.
(Innis, Speiden & Co., 46 Cliff St., N. Y.)
25 lbs. Common Salt.
2 lbs. Soda Ash.

Enter at 180° F., and dye at a boil for one hour.

Direct Bright Yellow Conc. possesses the characteristic properties of the direct cotton colors.

Recipe No. 67.

Black on Cotton Yarn.

Kalco Fast Black D on 100 lbs. cotton yarn. Prepare the dye bath with

5 lbs. Kalco Fast Black D.
(Kalle & Co., 530 Canal St., N. Y.)
25 lbs. Common Salt.
½ lb. Soda Ash.

Dye at a boil for one hour, and develop by the usual method in a cold bath containing

1½ lbs. Developer A Z.
1 lb. Sodium Acetate.

Kalco Fast Black D when dyed and after-treated gives a black possessing good fastness to washing, acids, alkalies and boiling water. Its fastness to light and weather is fair.

Recipe No. 68.

Scarlet on Cotton Yarn.

Dianil Fast Scarlet 4 B L on 100 lbs. cotton yarn. Prepare the dye bath with

4 lbs. Dianil Fast Scarlet 4 B L.
(H. A. Metz & Co., 122 Hudson St., N. Y.)
25 lbs. Common Salt.
2 lbs. Soda Ash.

Enter at 180° F., and dye at a boil for one hour.

Dianil Fast Scarlet 4 B L possesses very good fastness, and will be found valuable in the dyeing of cotton and wool, or cotton and silk, union goods, it dyeing the cotton much heavier than the animal fiber.

Recipe No. 69.

Green on Cotton Yarn.

Oxamine Pure Green G on 100 lbs. cotton yarn. Prepare the dye bath with

3 lbs. Oxamine Pure Green G.
(Badische & Co., 128 Duane St., N. Y.)
20 lbs. Glauber's Salt.

Dye at a boil for one hour, then run for 1/2 hour more with the steam shut off.

Oxamine Pure Green G gives a very bright green, and its fastness is very good for a direct cotton color. Upon after-treatment with copper sulphate it assumes an olive green cast with a somewhat increased fastness to light and washing. Soda ash should not be used, as its action is unfavorable.

Recipe No. 70.

Blue on Worsted Yarn.

Fast Sulphon Blue B on 100 lbs. worsted yarn. Prepare the dye bath with

4 lbs. Fast Sulphon Blue B.
(W. F. Sykes & Co., 85 Water St., N. Y.)
5 lbs. Acetic Acid.
10 lbs. Glauber's Salt.

Enter at 160° F., raise slowly to a boil, and dye at a boil for 3/4 of an hour.

Fast Sulphon Blue B shows exceptional resistance to light, and remarkable fastness to scouring and fulling, and is adapted for coloring all goods for men's wear and ladies' dress goods.

Recipe No. 71.

Brown on Cotton Yarn.

Tetrazo Sulphur Brown 2 R on 100 lbs. cotton yarn. Prepare the dye bath with

10 lbs. Tetrazo Sulphur Brown 2 R.
(American Dyewood Co., 84 Water St., N. Y.)
2½ lbs. Sodium Sulphide Conc.
1½ lbs. Soda Ash.
75 lbs. Common Salt.

The ingredients are dissolved as usual for sulphur colors, the material entered just below the boil, and dyed at this temperature for one hour.

Tetrazo Sulphur Brown 2 R is distinguished by its comparatively red tone, its ready solubility, and its level dyeing properties. It also possesses excellent fastness to light and fulling and will be found useful and economical for practical work.

Recipe No. 72.

Blue on Cotton Yarn.

Cross Dye Bright Blue B Extra on 100 lbs. cotton yarn. Prepare the dye bath with

5 lbs. Cross Dye Blue B Extra.
(Read Holliday & Sons, 11 Gold St., N. Y.)
15 lbs. Sodium Sulphide.
5 lbs. Soda Ash.
40 lbs. Common Salt.

Enter the boiled-out yarn at the boil, and then work for one hour without steam.

Cross Dye Bright Blue B Extra possesses good leveling properties.

Recipe No. 73.

Red on Worsted Yarn.

Diamond Red G on 100 lbs. worsted yarn. Prepare the dye bath with

3 lbs. Diamond Red G.
(Farbenfabriken of Elberfeld Co., 66 Lafayette St., N. Y.)
10 lbs. Glauber's Salt.
3 lbs. Acetic Acid.

Enter at 40° F., bring slowly to a boil and dye at a boil for one hour. Then add

1½ lbs. Potassium Bichromate,

and continue the boiling for one hour.

Diamond Red G possesses good fastness to light, washing and fulling.

Recipe No. 74.

Yellow on Cotton Yarn.

Direct Yellow R on 100 lbs. cotton yarn. Prepare the dye bath with

2 lbs. Direct Yellow R.
(Geisenheimer & Co., 189 Front St., N. Y.)
25 lbs. Common Salt.

Enter at 180° F., and dye at a boil for one hour.

Direct Yellow R can be recommended on account of its cheapness, its level dyeing properties, and its fastness to light.

Recipe No. 75.

Blue on Cotton Yarn.

Tetrazo Sulphur Indigo Conc. on 100 lbs. cotton yarn. Prepare the dye bath with

12 lbs. Tetrazo Sulphur Indigo Conc. (American Dyewood Co., 84 Water St., N. Y.)
15 lbs. Sodium Sulphide Conc.
5 lbs. Soda Ash.
75 lbs. Common Salt.

Care should be taken to insure complete solution of the dyestuff which should be previously dissolved in a separate vessel with the sulphide of sodium and the soda ash.

For a standing bath 2/3 of the quantity of dyestuff may be used.

Tetrazo Sulphur Indigo Conc. produces rich indigo shades on cotton, of extreme fastness to light and fulling.

Recipe No. 76.

Green on Worsted Yarn.

Fast Russian Green on 100 lbs. worsted yarn. Prepare the dye bath with

3 lbs. Fast Russian Green. (F. E. Atteaux & Co., 176 Purchase St., Boston, Mass.)
4 lbs. Sulphuric Acid.
20 lbs. Glauber's Salt.

Enter at 160° F., and dye at a boil for one hour.

Fast Russian Green will not stain white cotton thread decorations.

Recipe No. 77.

Black on Worsted Yarn.

Alphanol Black 3 B N on 100 lbs. worsted yarn. Prepare the dye bath with

7½ lbs. Alphanol Black 3 B N. (Cassella Color Co., 182 Front St., N. Y.)
10 lbs. Glauber's Salt.
5 lbs. Acetic Acid.

Enter at 140° F., and after boiling 3/4 of an hour add

4 lbs. Acetic Acid,

and boil to exhaust the bath.

Alphanol Black 3 B N will be found useful in the dyeing of woolen and worsted piece goods, giving very good fastness to light, alkalies and perspiration.

Recipe No. 78.

Blue on Cotton Yarn.

Cross Dye Bright Blue G on 100 lbs. cotton yarn. Prepare the dye bath with

5 lbs. Cross Dye Bright Blue G. (Read Holliday & Sons, 11 Gold St., N. Y.)
15 lbs. Sodium Sulphite.
5 lbs. Soda Ash.
40 lbs. Common Salt.

Enter the boiled-out yarn at the boil, and then work for one hour without steam.

Cross Dye Bright Blue G possesses good leveling properties.

Recipe No. 79.

Violet on Cotton Yarn.

Brilliant Congo Violet R on 100 lbs. cotton yarn. Prepare the dye bath with

3 lbs. Brilliant Congo Violet R. (Berlin Aniline Works, 213 Water St., N. Y.)
40 lbs. Glauber's Salt.
2 lbs. Soda Ash.

Dye for one hour at a temperature just below the boil.

Brilliant Congo Violet R possesses fastness to light and weather somewhat better than the ordinary substantive blues, and its fastness in other respects is equal to or better than other direct cotton colors.

Recipe No. 80.

Yellow on Worsted Yarn

Paranol Acid Yellow G on 100 lbs. worsted yarn. Prepare the dye bath with

2 lbs. Paranol Acid Yellow G. (E. M. Thayer & Co., 411 Atlantic Ave., Boston.)
10 lbs. Glauber's Salt.
2½ lbs. Sulphuric Acid.

Enter at a temperature of 140° F., and dye at a boil for one hour.

Paranol Acid Yellow G will be found particularly valuable in the production of compound shades. It gives a shade very similar to that of fustic.

In 1908 the United States produced 6,501,000,000 pounds of cotton, 311,138,000 pounds of wool and 11,250,000 pounds of hemp.

The world's production of animal silk has increased during the past century from 30,000,000 pounds to about 60,000,000, valued at $255,125,000. The approximate annual production of artificial silk is about 8,000,000 pounds, which is unequal to the demand.

New Machinery and Processes

This department is designed to present from month to month a brief mention of new machinery, devices and processes being brought out in this country and abroad, that are of interest to the textile manufacturers. It is not a list of patents but of improvements on the market, the idea being to present to our readers a systematic monthly record of new machinery, etc., of interest to textile mill men.

Whenever possible we endeavor to make a personal investigation of the new machinery and processes described in this department. In the absence of such personal investigation we must necessarily rely upon information obtained from those who control the machines and processes.

We invite machine builders and others to send us such information for this department.

Steel Pulleys. The American Pulley Co., of Philadelphia, have added to their line a range of new diameters from 50 to 60 inches inclusive. These new sizes embody the leading points of mechanical excellence, with the exception that for strengthening purposes the larger diameters have eight arms instead of the usual six arms.

New Dyeing Machine. The Beckman Co., Cleveland, O., are bringing out a new dyeing machine for which many advantages are claimed. It is known as the Psarski machine and is claimed to dye stock slubbing or yarn of any kind and in any form with all types of dyestuff. The machines are now being built of various sizes, with capacity ranging from 10 to 500 pounds to a load. It is also adapted for bleaching. The machine has been developed and is now in operation at the mill of the Beckman Co., where it may be inspected, and from whom information may be obtained.

Testing Apparatus. Alfred Suter, 487 Broadway, New York, is introducing to the American trade the well known textile testing apparatus manufactured by Henry Baer & Co., Zurich, Switzerland. A description of the Baer yarn testing instruments will be found in this issue.

Automatic Loom. Spinnerei und Weberei Steinen, Baden, Germany, have made arrangements with the Webstuhl und Webereimaschinenfabrik Rueti, Zurich, Switzerland, for building the automatic bobbin-changing loom which has been developed in the mills of the first named company. Forty-eight of the new looms have been operated for a long time in order to test their efficiency, and the arrangements that have been made for building the loom in Switzerland show that the results of this test have been successful.

Drying Machine. Fielden & Co., Rochdale, England. An improved machine for drying bleached and dyed cops, cross-wound bobbins and hanks. The material is placed on galvanized iron trays and subjected to a current of hot air.

Spooler Guide. The Draper Co., Hopedale, Mass., are placing on the market the MacColl patent spooler guide for removing slubs or bunches from cotton and worsted yarn during the spooling process. It breaks the thread when a slub or bunch reaches the guide. It is the invention of the son of J. R. MacColl and was perfected in the Lorraine Mills, Pawtucket, R. I.

Bobbin Holder. Wesser & Co., Velbert, Germany. A device for holding bobbins on spinning or shuttle spindles. The bobbin is pressed over a metal swell on the spindle, the expansive force of the swell holding the bobbin firmly in position.

Cloth Beam. Hans Schneppenhorst, Krefeld, Germany. A device for winding the cloth on looms weaving two thicknesses of plush or velvet at one time.

Scouring Wool. Renoni Lagye, Antwerp, Germany. A process of scouring wool by the aid of an electric current.

Warp Stop Motion. Meyer Kauffmann, Tannhausen, Germany. A new warp stop motion which, it is stated, is working successfully in a number of German mills.

Drying Machine. J. P. Bemberg, Barmen, Rittershausen, Germany. An improved automatic dryer for skein yarn and other textile materials. The claims include a large production and greater economy of steam and power.

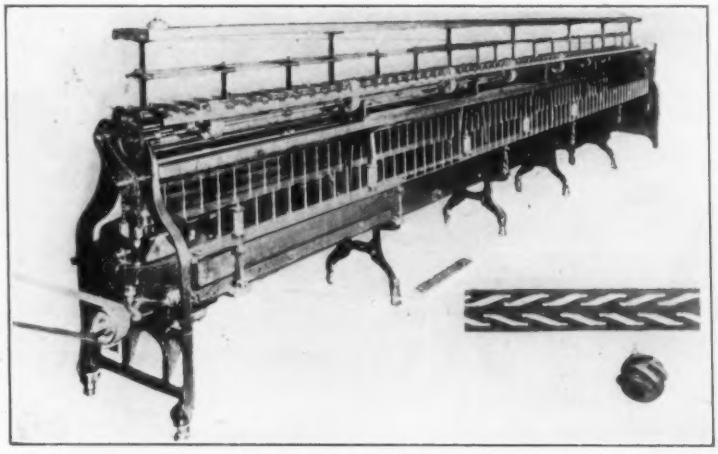
STEEL BAND POWER TRANSMISSION FOR SPINDLES.

Power transmission by steel band has now reached the textile industries. The Brown Spin-Wright method, controlled by the Brown Spin-Wright Construction Company, 32 Union Sq., New York, transmits power by a continuous steel band, driven by two pulleys, one at each end of the spinning or twisting frame, the band being so perforated that the sprockets at base of the spindles are rotated at a uniform and positive speed. Friction is absent, for the steel band connects with the sprocket, which in turn has its bearing on the spindle bolster. The sprocket is connected to the spindle with flexible studs, which take hold at the center of its bearing. The necessary consequence is free and perfect centering of the spindles. The smooth operation of the band and spindles enables the spinning and twisting of all kinds of textiles without regard to grades or sizes.

The spindle, by a simple device, is readily disconnected from its sprocket. This permits tying up of ends, doffing the bobbin, or taking out the spindle, without interfering with the running of any other spindles.

The mechanism of this drive is completely enclosed in an oil and dust-proof rail, in which run the steel band, driving pulleys, spindles and sprockets. This oil-tight rail insures perfect and automatic oiling, clean machinery, clean floors, clean frame and clean work; as well as security for operatives.

The textile trades have long sought a positive spin and twist, i. e., a frame geared, for example, to spin 15 turns per inch ought ideally to have every spindle at all times giving uniformly 15 turns. This has never been accomplished in practice, but a steel band with herring-bone perforations engaging herring-bone sprockets at fixed intervals, necessarily gives an absolute movement and a positive spin.



FRAME EQUIPPED WITH STEEL BAND POWER TRANSMISSION FOR SPINDLES.

The steel band drives without pressure on the spindles, and obviates the pull of the cotton belt and the push of the leather belt: making thereby a saving asserted to be 50 per cent. in power. The speed may be geared high or low as desired, and 25 to 50 per cent. over present speeds may be had without any increase in power costs.

Tests made with the Draper style spindle are reported to be very successful. The fundamental principle is covered by patent 465,466 issued on May 10.

The perfection of the product is the chief advantage from the consumers' standpoint; for cork-screws and steaks in cloth, and weak spots in thread, are eliminated.

The manufacturers expect to supply the complete machine, equipped with their band and also to supply band and sprocket attachments for present frames.

THE POTTER & JOHNSTON DOUBLE HOPPER FEED.

The illustrations show the improved double hopper feeder built by the Potter & Johnston Machine Co., Pawtucket, R. I., for feeding cotton openers. Fig. 1 is a view of the machine adapted to a short opener beater. Fig. 2 is a sectional view of the same machine.

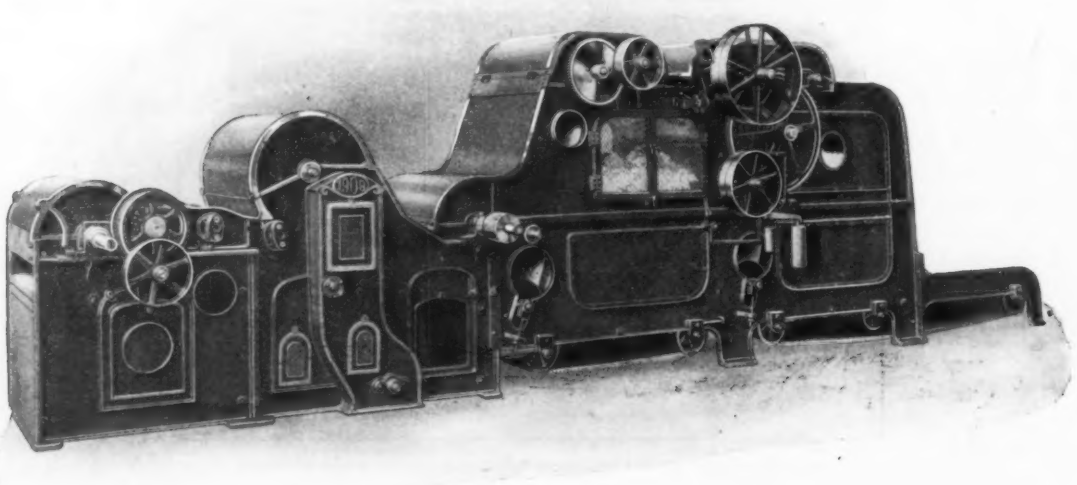


FIG. 1.

The cotton is thrown onto the rear apron at A, either direct from the bale in as large flakes as a man can lift off from same, or from opening bins as preferred. The cotton thrown on the apron, A, is carried inside of the machine and rolled up somewhat in the form of a ball as shown in the outline. A very heavy spoked apron, B, acts on this cotton intermittently and carries the cotton over into the hopper, V, maintaining a constant supply of cotton to be acted on by the spiked apron, D, this apron having slats and pins of the usual weight.

The intermittent action of the apron, B, is accomplished by the following means: Y shows a feeler plate pressing against the back of the cotton in hopper, V, and hinged on a shaft at X. The end of the feeler at Y will work back and forth from Z8 to Z, it being constantly held up against the cotton by means of a weight lever on the outside of the machine acting through shaft, X. This weight by means of levers connected to a belt shipper starts the apron, B, when the cotton in chamber, V, gets slightly below its normal supply and allows point of Y to approach Z. As soon as the apron, B, delivers cotton enough into the chamber, V, the peeler, Y, is pressed back toward the point, Z′, and this pushes the belt onto the loose pulley, and the apron, B, stops until the cotton in chamber, V, allows the feeler, Y, to swing again over toward the point, Z, when the operation is again repeated; this action taking place constantly without any attention.

By maintaining in the chamber, V, a constant quantity of cotton, the spiked apron,

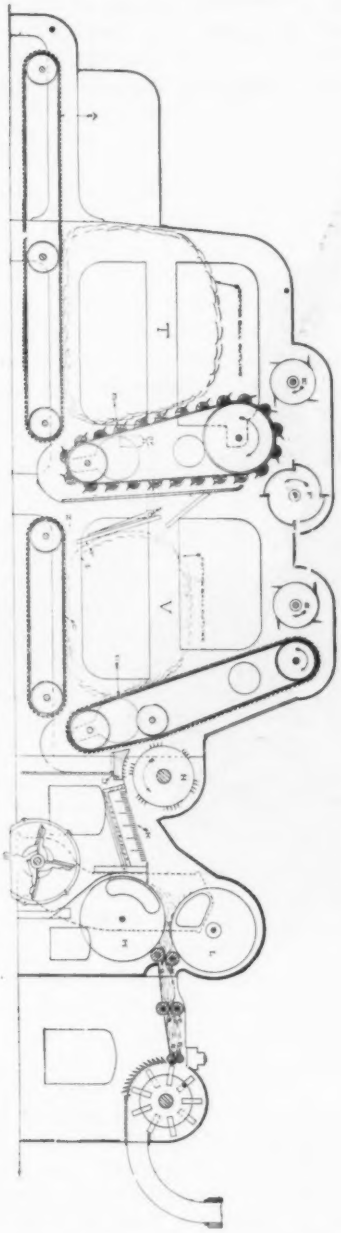


FIG. 2.

D, acts under uniform conditions, and therefore delivers a regular quantity of cotton. The apron, D, is stripped by the pin beater, H, and the cotton is carried up to the cages, L and M, by the suction from the fan. The flat grid bars, K, between the pin beater and cages are made of sheet steel. There are about 40 of them, these taking the place of the flat cast iron leaf bars with which all are familiar. The distance between the cages and the first beater is increased as compared with the usual construction in order to give a larger seed dropping chamber, W, under the beater. In order to carry the cotton from the stripping rolls, N and O, to the feed rolls, R and S, a pair of carrier rolls, P and Q, have been added. This machine delivers an even, regular sheet of cotton to the feed rolls of the first beater, R and S, giving the beater a constant and an even sheet to operate on. Owing to the evenness of the sheet, the cotton is held firmly between the feed rolls without thin places to be drawn through without beating.

The suction fan connected with the cages, L and M, obtains air from the opening over the feed apron, A. This air thus circulates through the hoppers, coming in close contact with the tumbling cotton and has a very beneficial action, increasing the efficiency of the cleaning and beating process which follows, and also preventing any dust and fly from escaping into the room.

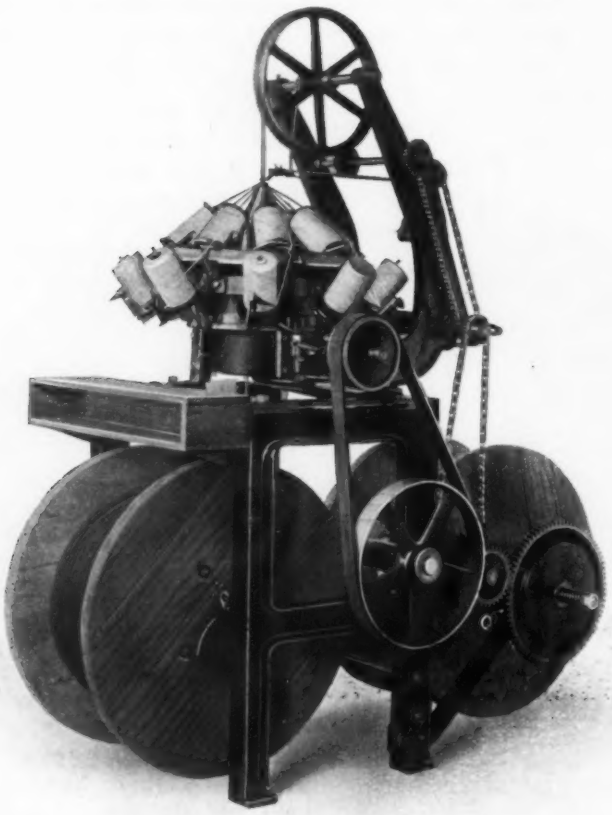
The cotton, when it arrives at the feed rolls, R and S, is in a thoroughly loose and bloomed condition and ready for the action of beating without danger of injuring the staple. These machines are in operation in a number of both Northern and Southern mills and are giving complete satisfaction, as shown by the receipt of a number of repeat orders.

The average number of persons employed in the woolen and worsted industry of Huddersfield, England, is 257,017, of which 247,920 are wage-earners and 9,097 working on a salary.

Of the 8,895,970 bales of cotton exported from the United States in 1909, 3,665,355 bales went to the United Kingdom, 2,438,090 to Germany and 1,098,173 to France.

THE INTERNATIONAL BRAIDING MACHINE.

One of the exhibits at the recent textile machinery exhibition in Boston that attracted a great deal of attention and much favorable comment was the International braiding machine shown by the Mossberg Wrench Company of Central Falls, R. I., the manufacturing agents. This new machine was demonstrated running at a speed five times as great as that of the ordinary braider, and covering insulated wire at the rate of more than seventy-five inches per minute.



THE INTERNATIONAL BRAIDING MACHINE.

The first published description of this new rapid braider was printed in this magazine some months ago and the machine has now been developed to its final stage for economical manufacture and practical operation in producing every variety of tubular braid.

The machine on exhibition, as shown in the accompanying illustration, has sixteen carriers and is fitted for covering insulated code or service wire used in great quantities for all kinds of electrical wiring. Machines having twenty-four carriers are also in operation on the same character of work, and still larger braiders, running up to fifty-six or more carriers, are being designed for other requirements.

For many years inventors have been striving to produce an improved braiding ma-

chine, but up to the present time none of the so-called "rapid" braiders has been successful in fulfilling the necessary requirements for practical and continuous service. The present machine passed the model stage long ago and has been developed and perfected in actual practice. It is evident from the appearance and running of the machine that its design and construction are based on scientific principles. Persons who examined it not only marveled at its great rate of production, but were also surprised at its quiet running as compared to the old style of braider. When operating at maximum speed there is only a soft purr and a slight click-click to be heard, reminding one of a well-oiled, smooth-running engine. This light-running quality is an important feature, as it means that very little power is required and that friction and wear are reduced to a minimum. The advantages of this are obvious as it makes for low cost of operation and great durability.

A brief description of the principle on which the machine operates will give some idea of the advantages gained. In the regular type of braider it will be remembered that the carriers or bobbins dodge each other as they revolve about the axis of the machine. In other words, they follow the familiar principle of the May-pole dance and travel a sinuous course, in and out around the machine. This makes it necessary that they run in tortuous grooves and they must be driven by spur gears underneath, with the carriers shifting from one gear to another. Any one who has seen this style of braider realizes the great amount of frictional resistance encountered in moving the carriers in their grooves or tracks, requiring power and entailing wear, while production is at a comparatively slow rate.

In the "International" machine the carriers do not dodge in and out to pass each other, but are simply revolved about the machine in concentric circles. The bobbins are arranged in tiers, one tier above the other, and with the two series of bobbins revolving in opposite directions. Instead of moving the bobbins themselves to pass by each other, the relatively light yarns are deflected. Stated briefly, the yarns from the lower bobbins vibrate in and out in a radial direction to pass over and under the upper bobbins. The mechanism for performing this operation is exceedingly simple and relatively light so that it can be operated at a high rate of speed without undue influence from momentum and inertia.

By an ingenious arrangement of what might be termed the "switches," the lower yarns are controlled so as to pass either over or under the upper bobbins as required. By a slight adjustment of this mechanism the machine can be changed to produce three different varieties of braid without the addition of a single element. This is said to be the first machine ever built in which both plain and basket braid can be produced without changing the mechanism or substituting new parts. In the usual type of braider it is necessary to remove one-half of the whole number of carriers in changing from plain braid to the basket, and this necessarily reduces the productive capacity.

The new machine is self-oiling, to insure against wear, and its parts are correctly designed and of substantial proportions to provide against damage, breakage or derangement. Particular attention has been given to adapting the machine for convenience of operation. The heavy wire supply reels are applied from below and can be rolled into position to adjust themselves to their bearings.

With ordinary machines in use for braiding rubber-covered wire it has in some cases been found necessary to economize space by placing the reels overhead, requiring more labor in handling the heavy reels and liability to accident from the reels falling.

The take-up device is operated by a simple arrangement of chain driven sprockets, and is claimed to be a great improvement over the usual style of worm-gear driven take-up. By a simple system of guiding device the wire is wound on the reel with precision and accuracy, so that it can be unwound without hindrance. The supply bobbins are placed in such positions and are so exposed

as to be convenient of access to the operator in piecing up or replenishing. The new machine also has a very effective stop-motion and braking device, so that its operation is arrested almost instantaneously with the breakage or exhaustion of any one of the supply yarns.

A mill test has recently been made of which particulars are given out as follows:

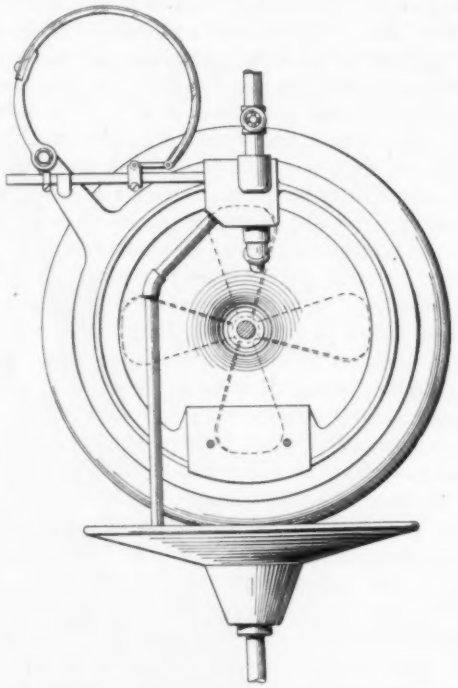
"An equipment of 24 carrier machines running alongside of a number of standard braiders during the past several months showed comparative production as follows: On No. 14 code wire each International machine produced from 79 to 82 1/2 inches of covering per minute against a 15-inch maximum production per minute on the standard machine. For a day's run the International machines averaged easily five times the production of the old type of braider. The product of the International machine was also superior in many respects to that of the other machines, and a substantial saving in yarn was realized on account of constant and proper degree of tension on the separate yarns and the consequent laying on of the yarn tight and flat."

The Mossberg Wrench Company, Central Falls, R. I., manufacturing agents for this new braiding machine, are now at work on tools for its manufacture in large quantity. The new machine is practically ready for the market and inquiries will receive careful attention.

AUTOMATIC HUMIDITY CONTROL.

The successive stages in the development of any art or science are gradual. Many observant men may have noticed a fact in nature or in manufacture, but it has waited for one man to take hold of it vigorously, or he may have stumbled on an idea; in either case that one man proceeds to develop or build on that particular fact or idea, or there may be several men at work on the same fact or idea and they develop it on different lines. The general public accepts the new departure slowly. After the public has gradually become convinced that an idea or machine is good under certain conditions, it often assumes that it cannot have too much of the good thing, and then it requires time again to realize under just what conditions that thing is good.

This is the usual course, and it has been exactly the course of development as to humidification in cotton manufacturing and other industries. Intelligent observers knew that different atmospheric conditions made great difference in how their work would run, but the idea of artificial humidification was accepted slowly by mill men, while now it is generally accepted as a necessity. The average carder, spinner or weaver, having accepted the idea that humidification is a good thing, is apt to think that he cannot have too much of a good thing and then runs his humidifiers when he had better not, for too much humidity is as bad as too little.



THE HYGROSSO HUMIDIFIER WITH AUTOMATIC CONTROL.

This state of affairs calls for the automatic control of moisture supplied, and to meet this demand, John W. Fries, 45 Lafayette St., New York, has devised and has a patent pending on an attachment to his well known Hygrosso humidifier, which has the merits of efficiency, simplicity and moderate cost.

The illustration shows the motor driven Hygrosso with automatic regulator attached

on the upper part of the frame. The small well shown contains an inclined nozzle which communicates with the water supply pipe. The lower part of this well is provided with an elongated tubular opening adapted to receive the water from the nozzle when not otherwise prevented. The water received in the tubular opening flows downward into the pipe which delivers the water to the humidifier. The tubular opening in the bottom of the well is narrower than the well so as to form a space which receives the stream of water from the nozzle if the valve be opened too much. This prevents any possibility of supplying too much water to the humidifier and causing what is generally termed "wetting down." Any water passing from the nozzle which does not find its way into the tubular opening is received in the well and carried off by the overflow pipe.

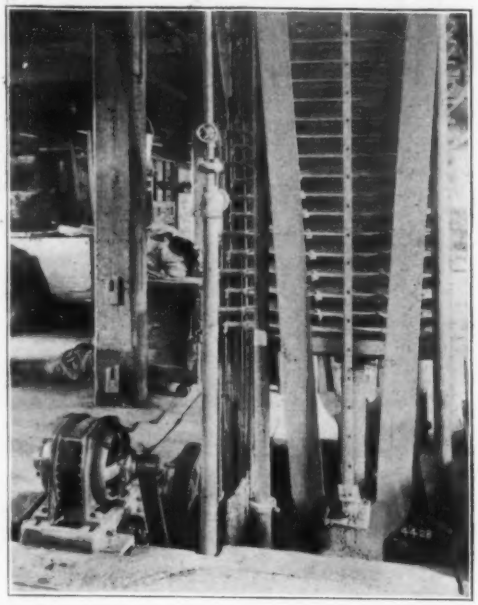
A reciprocating bar is provided at its end with a water-diverting head and adapted to be moved to contact with the stream of water issuing from the nozzle in the small well whenever it is desired to divert the water from falling into the tubular opening. This action reduces or cuts off entirely the water supply to the humidifier and the instrument is set so this will take place when the relative humidity is at desired point. This diverting head and bar is restricted in its movement by an adjustable stop. This adjustment is made so the head may move in front of the stream of water just sufficient to divert it.

The reciprocating bar is moved by means of the expansion and contraction of the curved proportion, which is connected to the bar by means of a lever. This curved portion is of compound construction, having an outer band of brass and an inner curved part of wood. Wood parts are sawed with the grain running substantially at right angles to the outer edge of the strip, which makes the device very sensitive. The expansion and contraction of the curved portion is effected entirely by changes in the hygrometric conditions of the atmosphere so the instrument may be set to have the reciprocating bar divert water supplied to the humidifier at any percentage of relative humidity desired. Once set it requires no further attention, and is remarkably accurate and sensitive, regulating the water supply to the humidifier in response to the slightest hygrometric changes.

The Hygrosso thus provides automatic control of each head as a complete unit which can be adjusted to control the humidity in its own 20,000 or 25,000 cubic feet of air space. It matters not how many Hygrosso humidifiers there may be in a room, it is claimed they can be set so the humidity will be uniform throughout the room. Different parts of the room may be independently controlled.

"MAXIMUM" SILENT CHAIN.

This power transmission chain, made by the Link-Belt Company, Philadelphia, Chicago and Indianapolis, has been adopted

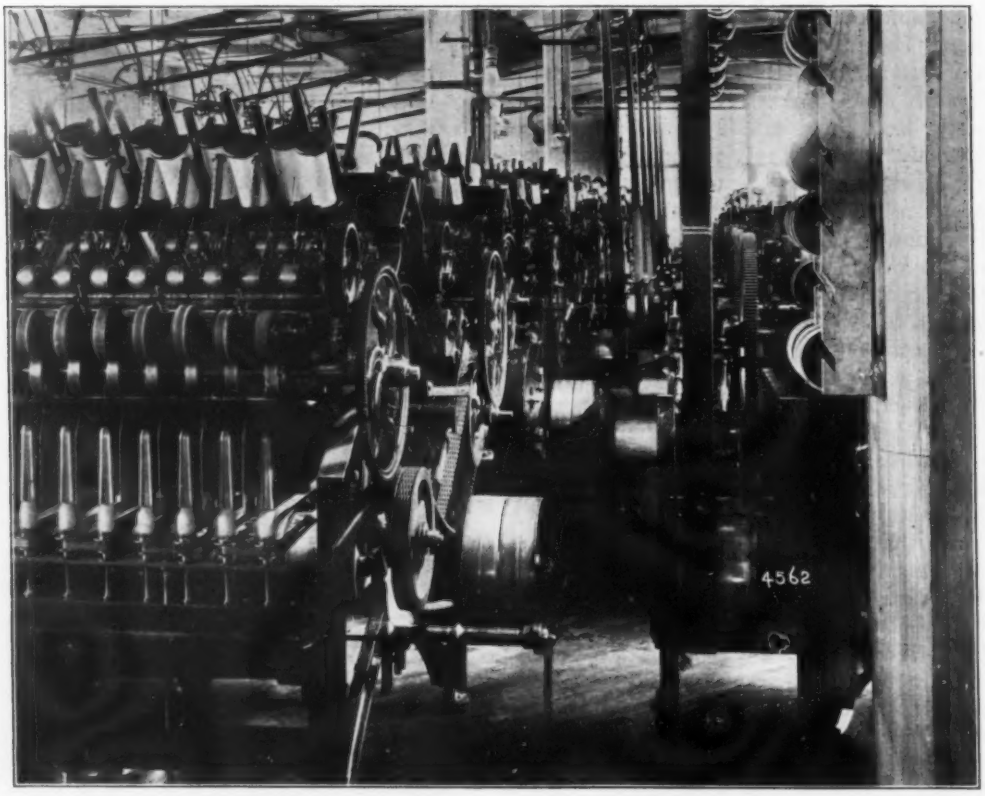


A 5 H. P. "MAXIMUM" SILENT CHAIN DRIVE OPERATING A HOSIERY PRESS.

with a great deal of success by many textile mills and firms in allied lines. The feature which most commends the use of this chain is its accurate working, a point upon which

every textile manufacturer or operative insists.

As we cannot give space in this issue to an extended description of the design and construction of the chain, we show several illustrations which are in themselves self-explanatory of the facility with which such



2 H. P. "MAXIMUM" SILENT CHAIN DRIVE OPERATING WORSTED YARN SPINNING FRAMES.

drives may be used. In a later issue we will describe in detail various elements touching upon the development of this transmission and the economies effected by its application to textile machinery.

In plain cottons the American trade with China has fallen from 12,600,000 pieces a year to 1,600,000 in 1908, and Great Britain's trade has diminished from 13,500,000 pieces to 9,000,000; while Japan has gained from 800,000 pieces to 1,00,000.

WEIGHTING TOP ROLLS.

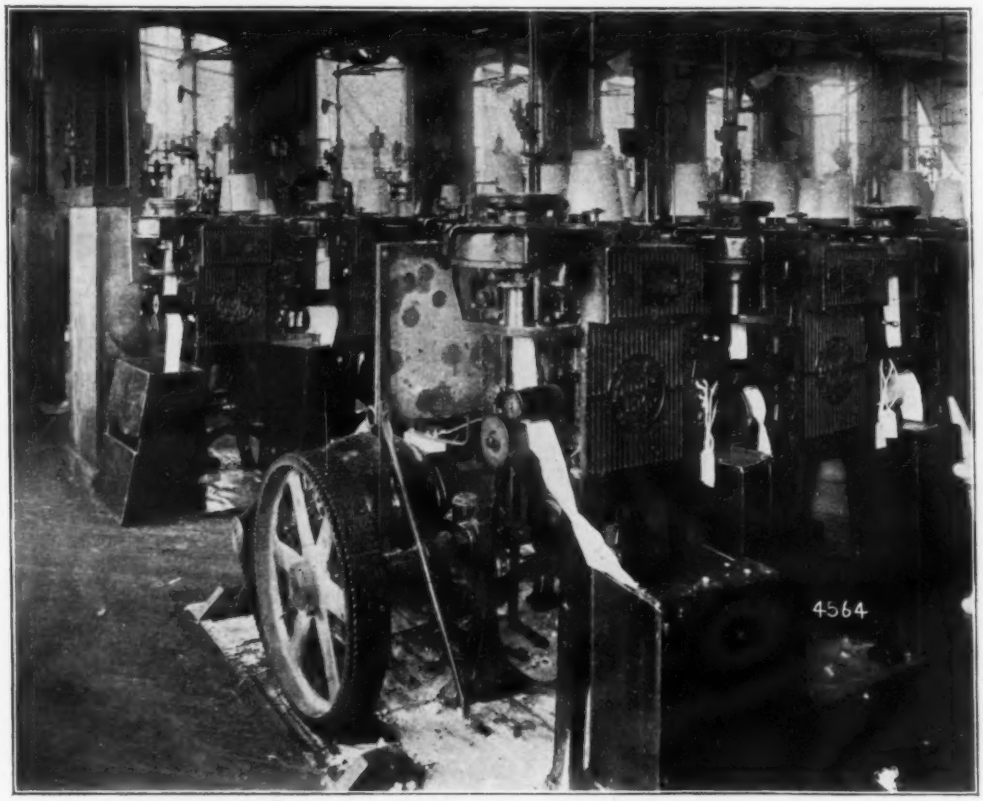
L. T. Houghton, Worcester, Mass., has invented a new method of weighting top rolls. One of the principal causes for uneven yarns is the defective weighting of top rolls. The customary method consists in the use of a saddle, a stirrup and a weighted lever. The chief defect in this method is the excessive weight that is found on the front roll, which is often four or five times the weight used on the middle or back rolls. That this front roll weight is excessive and expensive is beyond question. Another serious defect consists in the fact that the weight placed on a new roll remains the same until the roll is removed for recovering. There is no means for increasing this weight as the rolls become worn, and the result, as every spinner knows, is uneven yarn. With a

means to increase this weight on the worn rolls they will last longer and make better yarn. Every spinner has at times wanted to increase the weight on the top roll. The Houghton method of weighting top rolls apparently overcomes the above mentioned defects and which he believes will soon be considered indispensable in cotton spinning. The advantages of this method are summarized as follows: It enables the spinner to make better yarn, lessens the cost of roll covering, easier to remove and replace a roll and there is less weight on the floor.

During the fiscal year ending March 31, 1909, the imports of cotton goods into Canada were valued at $11,465,095.

BIRCH'S IMPROVED OPENING AND FOLDING MACHINE.

The illustration shows a new model of the patent opening machine or scutcher built by Birch Brothers, Somerville, Mass., delivering cloth to a mangle. A folder can be attached direct to the scutcher if it is desired to fold the cloth on trucks instead of delivering them to another machine.



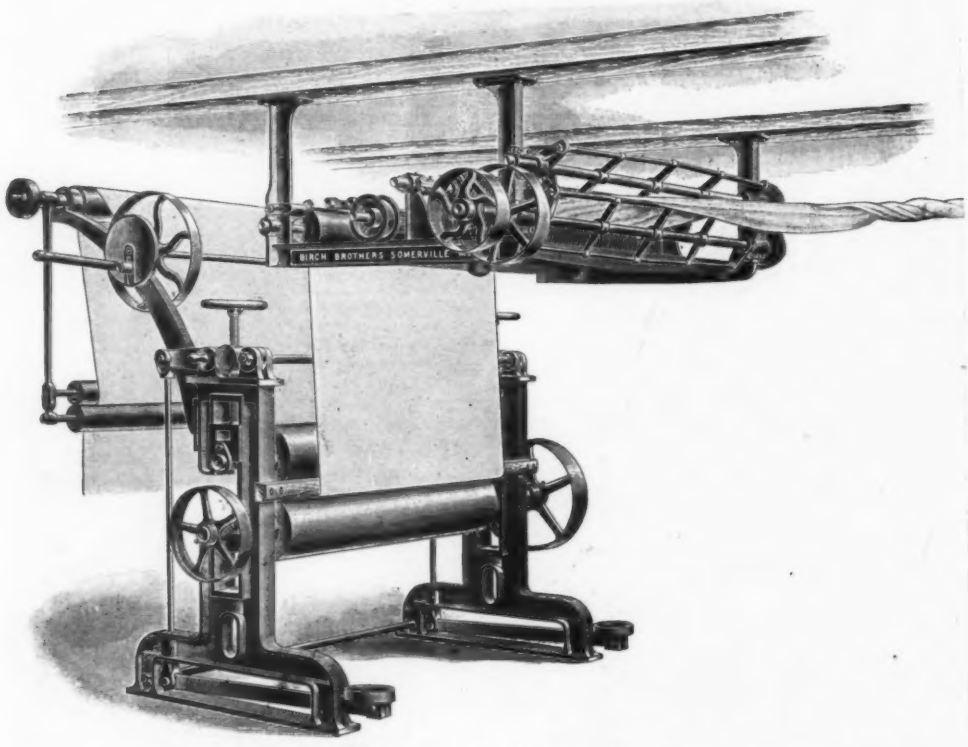
5 H. P. "MAXIMUM" SILENT CHAIN DRIVE OPERATING A LINE OF KNITTING MACHINES.

In most woolen mills the cloth, when it comes from the washer, is extracted, then opened up and folded by hand. This folding requires two men, is slow work, and occupies much floor space. In this, as in many other methods of handling goods, the cotton mills have long been in advance of the woolen manufacturers, but this work can and

is being successfully done in woolen mills by this machine.

The machines take up no floor space, as they are attached to the ceiling, and will handle light or heavy cotton, woolen and worsted cloths in either the wet or the dry state. At first thought it seems as if this work would necessarily require hand labor, chine, which delivers them on another truck, opened out straight and evenly folded, ready for dryer, gig, steaming machine, napper, or other process.

The cockles, creases and curled selvages are straightened out, and the goods present a smooth, even face, and are more easily fed to the machines than when opened by hand.



PATENT SCUTCHER DELIVERING CLOTH TO A MANGLE. (BIRCH BROS., SOMERVILLE).

owing to the goods being twisted into a rope form by previous handling in a very irregular way; but it has been found in practice that there are about as many twists to the right as there are to the left, and consequently when any considerable length of the goods is extended, the twists to the right balance those to the left, and allow the beaters and rolls on the opener or scutcher to open out and fold the fabric. The goods, coming from the extractor or washer, are lead to or loaded on trucks and wheeled to this ma-

The machine also acts as a brush, and it is surprising to see how much loose stuff, such as slugs and loose threads, is brushed off the goods in the wet process by the scutcher.

The machine requires no special knowledge to operate, is simple in construction, and can be run by a boy. This and earlier models of the machine are running in some of the largest mills in the country and can be economically employed in very moderate sized mills. The latest model, shown here, combines a number of improvements in

details, some of which have been protected by patent.

The advantages of the machine are summarized as follows:

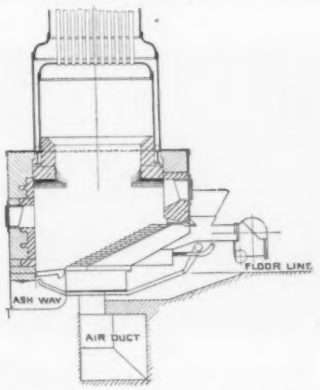
1. It can be easily attached to the ceiling, dispensing with the frame.
2. The small amount of space occupied.
3. The solid construction, the bearings being of extra length.
4. The governor is supported by a pin which swivels in a self-lubricating oil chamber, which permits it to swing freely and prevents the escape of oil on the floor and cloth.

Further information can be obtained on application to the builders.

TEST OF BOILERS AT THE EVERETT MILLS.

The power house of the Everett Mills of Lawrence, Mass., is equipped with Manning boilers and Taylor gravity underfeed stokers. In order to determine the commercial efficiency of the boilers and stokers Robert Amory, Jr., and D. L. Smith conducted a series of tests, which are interesting in that the boilers were operated at about 150 per cent. of the builders' rating. Four tests were run in order to get average results. Of these tests the first was of five hours' duration, the next two of 10 1/2 hours, and the third, 15 1/2 hours. The results recently published in detail by the American Ship Windlass Co., manufacturers of the Taylor stoker, are given here in abridged form.

In commenting on these tests, Charles H. Manning, consulting engineer, states that on the whole the plant shows very good efficiency, especially when the 50 per cent. overload is taken into consideration, and also the fact that the plant was run by men of short experience with the stokers.



TAYLOR STOKER APPLIED TO A MANNING BOILER.

In these tests no attempt was made to get the best possible results, as it was desired to find out just what the plant would do in ordinary service. This is shown by the methods of banking the fires and the fact that the tubes were not especially clean before the tests. Unfortunately the tubes

TEST NO.	WATER PER HOUR PER BOILER.			HORSE-POWER PER BOILER.			ECONOMIC RESULTS.			
	Water Evap. per Hour Corrected for Quality of Steam	Equivalent Evap. per Hour from and at 212 Degrees	Equivalent Evap. per Hour from and at 212 Degrees per Sq. Ft. of Heating Surface.	Horse-power Developed	Builders' Rated Horse-power	Percentage of Builders' Rated Horse-power	Water Apparently Evap. Under Actual Conditions per pound of Coal as Fired	Equivalent Evaporation from and at 212 Degrees per pound of Coal as Fired	Equivalent Evaporation from and at 212 Degrees per pound of Dry Coal	Equivalent Evaporation from and at 212 Degrees per pound of Combustible
	62	63	64	65	66	67	68	69	70	71
1	6,708	7,646	4.89	221.6	150	147.4	9.86	11.24	11.46	12.24
2	6,814	7,825	5.01	226.8	150	150.8	9.10	10.45	10.66	11.40
3	6,855	7,846	5.02	227.4	150	151.4	9.24	10.57	10.78	11.57
4	6,780	7,770	4.97	225.2	150	150.1	9.26	10.63	10.82	11.56

were much clogged with soot, causing a high flue temperature. As the fires during the tests were smokeless, it is presumed that the soot was due to the method of banking the fires at night. The fires were then burned very low, and from midnight

5600 H. P. BOILERS EQUIPPED WITH TAYLOR STOKERS AT THE EVERETT MILLS, LAWRENCE, MASS.

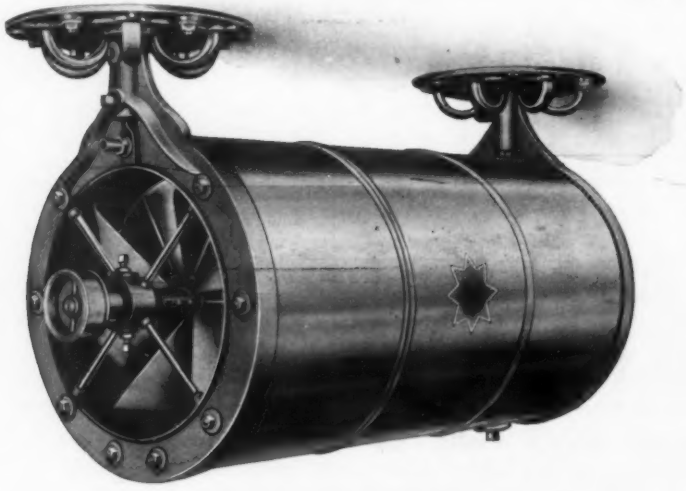
until morning were spread with coal by hand, so that in the early morning the fires were very green, which probably caused the deposit of soot on the cooler surfaces of the boiler.

THE TILLOTSON HUMIDIFIER.

In a large mohair and alpaca mill located near Providence, R. I., the Tillotson humidifier was conceived and developed by practical mill men under actual working conditions. Two years' operation of the machine under such circumstances proved its merits and justified its manufacture by the Tillotson Humidifier Company of Providence, and later its adoption in many of our large textile mills.

The design and operation of the Tillotson humidifier is such as to embody the combined functions of both the so-called evaporative and the spray principles of producing artificial humidification. It is distinctly an evapospray humidifier. It is powerful in its action; air in large quantities is not only forced over wet surfaces, but actually passes through a fine rain, gathering minute particles of flying water, and the whole is delivered to the atmosphere in any necessary volume, in the form of aqueous vapor and spray and with a motive force which causes it to "carry" until virtually all the free water has been converted into aqueous vapor or evaporated and become part of the atmosphere.

The Tillotson humidifier consists of a cylindrical copper casing, 3 1/2 feet long and 23 inches in diameter, containing all operating parts. End frames of cast iron enclose either end of the case and are fastened together by means of 8 1/2-inch tie rods.



THE TILLOTSON HUMIDIFIER.

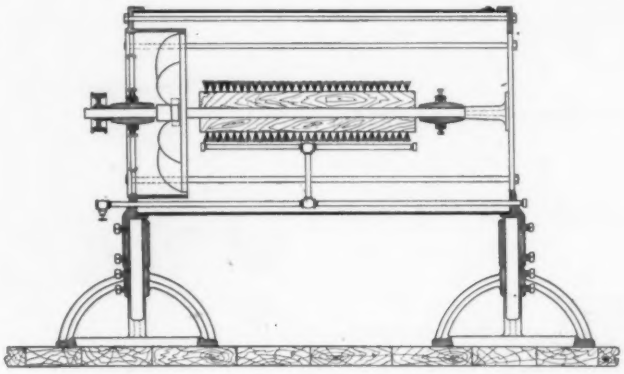
Mounted concentrically in this cylindrical casing, through end frames in babbitt lined,

self-oiling bearings, is a shaft one inch in diameter upon which are mounted a bristle brush, an aluminum fan and a cast iron flanged pulley. A mantle of Irish linen fastened to the eight tie rods lines the inside of the copper case. The whole is carried through adjustable spindles by two ceiling brackets. These suspension brackets are made upon different forms for use in low or high studded rooms.

The selection of the materials used in the construction of the machines was made after careful study of the conditions under which such class of machinery is operated. The casing is of copper, sixteen gauge, strengthened by buckling. The fan is of aluminum, the piping within the machine of brass, and all parts which come in contact with the water are made of non-corrosive material. The working parts are all constructed in the best manner possible from the best material obtainable. The brush, which has a very important function, consists of a cast iron core which carries a hard wood sleeve and into this sleeve the best Russian bristles are secured by means of copper wire. The fan is of the ordinary disc type and is mounted within one of the end frames. This frame carries a flange or apron which extends into the cylinder to the rim of the fan and is for the purpose of preventing back draft through the suction end of the humidifier.

The Tillotson humidifier is practically an individual unit. Central station equipment such as high pressure pumps, air compressors, or special machinery, is not needed. Water may be supplied to the machines from a city service, or it may be taken from tanks and delivered under a low head through pressure piping.

The fan and shaft of the humidifier may be driven by a light belt from any convenient line shaft. Group driving may be preferred, and a system consisting of a light shaft operated by a motor of suitable horse power can be installed from which the machines are belted direct. With such an installation a system of humidifiers becomes independent of the general machinery and may be run at such times as the mill machinery is idle, with the result that the desired atmospheric conditions may be maintained continually or brought up to the best working point before starting time in the morning.



A SECTIONAL VIEW OF THE TILLOTSON HUMIDIFIER.

The water is introduced to the humidifier through a delivery pipe located in the center of the casing just above the brush. As the water is delivered upon this rapidly revolving brush it is broken up into very fine particles and thrown tangently towards the wall of the cylinder along its entire length, giving, as a result, a chamber containing minute particles of water moving at a high velocity.

A current of relatively dry air is forced into the chamber at right angles to the moving particles of water. This current is produced by the fan, and owing to the large

surface of water that is exposed, is presented with the best conditions to take on moisture or humidity. The effect of this operation is that air passing through such an atmosphere of rain is cleaned and purified and carries a considerable amount of aqueous vapor out into the zone or space in which the humidifier is operated. In addition to this, the current of air carries along the small particles of water in suspension as a spray so fine that it is only visible when pierced by a sunbeam. The spray thus delivered carries thirty-five or forty feet, allowing the best opportunity for its final evaporation by actual contact with the surrounding air. Further information can be obtained on application to the builders.

THE TESTING OF FIBERS AND FABRICS.

The firm of Henry Baer & Co., Zurich, Switzerland, is well known throughout Europe as manufacturers of high grade

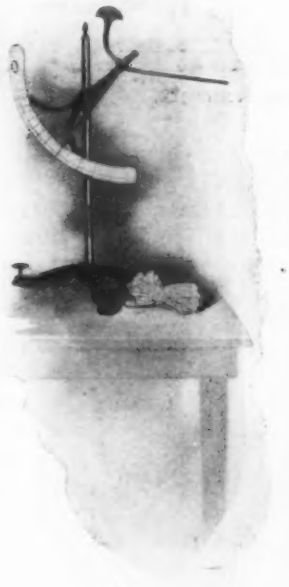


FIG. 1.

testing machines for textile materials, and their apparatus will be found in the mills of every Eurpoean country. They have appointed Alfred Suter, 487 Broadway, New York, as their American agent. The Baer instruments are in extensive use in the American silk trade, among the users being the United States Silk Conditioning Company of New York, and it is intended now to push their sale in the cotton, wool, linen and jute trades.

Fig. 1 shows the Baer quadrant or lever scale for testing the size of yarn. The instrument is very sensitive and the tests are

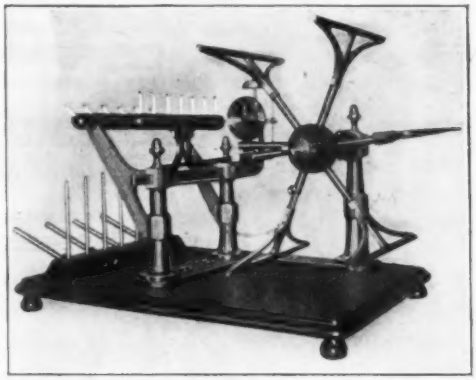


FIG. 2

quickly made because of the division of the dial, which corresponds to the number of the yarn. After suspending say 120 yards of yarn on the hook the size can be read directly on the dial. The Baer reels have been especially designed to secure accuracy and convenience in handling. The handle of the reels is connected with a multiplying gear so that one turn of the handle corresponds with two turns of the reel.

Fig. 2 shows the reel with a clock and bell attachment. The yarn is tested for evenness on an apparatus which takes the threads from skeins, spools or cops and passes them over a board covered with black or white velvet, the object being to secure the greatest possible contrast between the thread and the ground. Several boards are supplied with each machine. In testing for strength and elasticity the test is made with a single thread which requires a more accurate machine, but which it is believed gives

better results than where a number of threads are tested together. The Baer automatic testing instrument is free from vibration, an even speed and steadily increasing strengthening of pull being obtained from beginning to end of test. The carriage has a piston which fits in an oil plunger and the speed can be regulated closely to suit any kind of yarn.

FIG. 3.

In making a test the single thread is placed between the set screws, which are 20 inches apart. Then the starting lever is lifted and the carriage glides on rollers along the round supports. When the yarn breaks both the elasticity and strength dials stop while the carriage goes to the bottom. The strength scale is generally divided into two parts, one for weak threads breaking at a tension less than one pound, the other for stronger threads up to six pounds. This testing machine is shown at Fig. 3.

Mr. Suter will be pleased to give further information regarding the Baer instruments and also to consult with manufacturers who may have special wants in respect to the testing of textile materials.

TESTING MOISTURE IN WOOL.

The wet wool question is of such importance among those connected with Australia's greatest industry that any suitable appliance for determining the vexed question as to whether wool is too wet to shear or not attracts attention. The conference representative of the Pastoralists' and Australian Workers' Unions has not yet finally accepted any for this purpose, although it has approved of the Richardson-Gillespie carbide wool tester, which was used in the tests made at different sheds last season. It is open to consider other machines. One invented by A. McLeod, and at present being exhibited at the office of Simpson & Co., in Sydney, New South Wales, certainly warrants very careful consideration as a medium of filling the purpose demanded.

The machine last named consists of a brass cylinder, in which the wool is placed. The cylinder is surrounded by an oil jacket, to act as a check to the heat from a spirit lamp placed underneath the cylinder. Connected with the cylinder is a tube, through which the moisture in the wool is forced, by the steam generated, into a graduated glass, which registers the amount of water. This glass contains kerosene; and the water, being heavier, sinks to the bottom, and is easily measured. To treat an ounce of wool by this process takes 20 to 25 minutes. It is very simple, being on the principle of a still, and is certainly effective as far as the lay mind can perceive.

At the end of a test witnessed by a writer in the Sydney Mail, a portion of the wool taken out of the cylinder was found burnt, and we understand that this is considered an objection. Why, it is not easy to understand, as it is, after all, only additional evidence that the moisture has been thoroughly driven out of the wool, and that is the object of the machine.—Textile Mercury.

Mill News

Those interested in receiving early and more complete investigated information of projected new mills, enlargements, improvements, fires, facts and gossip of the trade are referred to the TEXTILE ADVANCE NEWS, issued weekly by the publishers of the TEXTILE WORLD RECORD, at $15.00 per year.

(Other Mill News on Pages in Advertising Section.)

COTTON.

New Mills.

Massachusetts, Fall River. The promoters of the new finegoods mill have secured the necessary subscriptions to insure the success of the undertaking. The company will be capitalized at $1,000,000 and have equipment of 50,000 spindles and looms for making fine fabrics. It will be known as the Charlton Mill, taking its name from Earl P. Charlton, who is a large stockholder. James Sinclair, head bookkeeper at the Wampanoag Mills, will be treasurer. The site selected is in the south section of the city.

Massachusetts, New Bedford. Contract for construction of buildings for the new Quissett Mills has been awarded to B. F. Smith Co., and work will be started at once.

*Massachusetts, New Bedford. Contract has been awarded for construction work on buildings for the Neild Mfg. Co. and work will be started immediately.

Mexico, Estado de Jalisco, Guadalajara. A number of French dry goods merchants of this city compose the company which is rebuilding the cotton mill of the Compania Industriel de Guadalajara. The new mill will be larger than the old one and will cost about $600,000 for buildings and equipment.

*North Carolina, High Point. A charter has been granted the Pickett Cotton Mills with capital stock of $500,000. This refers to the new cotton mill in which the Southern Power Co., Robt. L. Steele of Rockingham, and W. P. and F. N. Pickett of this place are interested Plans will be prepared at once for a 12,000-spindle mill.

*North Carolina, North Wilkesboro. The Finwin Cotton Mill Co. has organized with the following officers: J. L. Erwin, Concord, president; T. B. Finley of this place, vice-president, and J. S. Vincent of Mebane, secretary and treasurer. They will expend about $70,000 in building and equipping a 3,000-spindle cotton yarn mill just east of North Wilkesboro.

*North Carolina, River Falls. Contract has been awarded by the River Falls Cotton Mills Co. for the building of their proposed 10,000-spindle mill, power house and dam. Work is to be started at once. The equipment of the mill will be 10,000 spindles for making 20s to 26s yarn and 240 40-inch looms. J. W. Menefee of Graham is president and treasurer.

*North Carolina, Winston-Salem. Contract has been awarded by the Inverness Mills Co. to J. F. Ange of Winston-Salem, for the erection of buildings, including a main structure, 2 stories high, 104 by 201 ft., separate boiler house, picker room and warehouse. The organization of this company was reported in January, the capital stock being $200,000. The installation of 10,000 spindles and 200 looms is planned. Cotton print fabrics are to be manufactured.

*Oklahoma, Lawton. Construction work has been started on buildings for the E. L. Shuford Mfg. Co. and they expect to be ready to begin manufacturing before the next cotton crop is ready. The main building will be 2 stories high, 75 by 460 ft., and will be equipped with 10,000 spindles and 300 looms. J. E. Sirrine of Greenville, S. C., is the architect and construction work is being done by Fiske-Carter Construction Co. of Worcester, Mass.

*Oklahoma, Muskogee. W. D. McNeill of Fayetteville N. C., and associates, are planning to build a $300,000 cotton sheeting mill. Buildings will be erected and 10,000 spindles with 300 looms installed.

*Oklahoma, Shawnee. Probably cotton yarns, colored cotton goods, duck and similar lines will be made in the proposed new cotton mill on equipment of 10,000 spindles, 300 looms, complete dye house, etc. It has not been announced who is interested in this project, but it is rumored a cotton manufacturing company of North Carolina will control the new company.

*South Carolina, Chesnee. The proposed cotton mill will be capitalized at $400,000. W. E. Burnett, president of the First National Bank of Spartanburg, will be president, and interested with him are John B. Cleveland, J. N. Cudd and R. K. Carson, all of Spartanburg.

*South Carolina, Columbia. The new Glencoe Cotton Mill has awarded contract to T. C. Thompson & Bro. of Birmingham, Ala., for construction of buildings to cost about $20,000. Five thousand spindles and electric power equipment for making twines and warps will be installed. T. Heber Wannamaker of Orangeburg is president, treasurer and buyer.

*South Carolina, Great Falls. Additional construction contracts have been awarded by the Republic Cotton Mills to T. C. Thompson & Bro. of Birmingham, Ala., and Charlotte, N. C., for the building of a reservoir, cotton warehouse, office, store building and numerous houses, to cost $100,000. Good progress is being made on the work of building the 25,000-spindle cloth mill and on the work of planning the two additional mills of 75,000-spindle capacity.

Enlargements and Improvements.

*Alabama, Spigner Station. In addition to changing from steam to electric power, the Alabama Cotton Mills will add 2,000 ring spindles. This equipment has been ordered. They are spending about $40,000 to improve the plant, as noted recently.

Connecticut, Danielson. The old machinery in the spooling department of the Quinebaug Co. is to be removed and new spoolers installed. A new yarn conditioner has just been added to the weaving department.

*Connecticut, Danielson. At a meeting of directors of the Danielson Cotton Co., it was voted to postpone construction of the dam across the Quinebaug River, owing to inability to reach a satisfactory agreement with owners of land. They will install instead a 400 h. p. steam engine, which it is expected will be in use by June 15.

*Connecticut, Willimantic. The new bleachery being built for the American Thread Co. is to be finished by September 1. Other particulars of this enlargement have been given. E. S. Boss is agent; C. J. Alpaugh, superintendent of finishing. The buying is done by R. L. VanDyke, 260 West Broadway, New York City. The plant will be shut down April 1 while the annual inventory is being taken.

Georgia, Scottdale. A device for preventing thin places in weaving has been bought for the 350 looms of the Scottdale Mills.

*Massachusetts, Chicopee Falls. Work is in progress on the new weave shed for the Chicopee Mfg. Co. The walls are to be of concrete blocks, which are now being made on the site of the mill.

*Massachusetts, Clinton. Contract has been awarded by the Lancaster Mills for the construction of their new 5-story mill, which has been already noted.

Massachusetts, Fall River. A new 1800 h. p. engine is being installed in the power department of the Stafford Mills.

Massachusetts, Fall River. A new engine is being installed in the Shove Mills of 600 h. p. capacity, and it is said a number of mules operated by this company are to be replaced with new ring frames. Improvements are also contemplated for the carding department.

*Massachusetts, Lowell. The Massachusetts Cotton Mills have awarded contract for the extension of the picker mill to P. O'Hearn. This enlargement will cost about $50,000.

Massachusetts, New Bedford. At the annual meeting of the stockholders of the Taber Mill, Inc., it was voted to increase the capital stock from $950,000 to $1,300,000. The new stock will be taken by the present bond holders in exchange for bonds issued a few years ago, cancelling all bonds outstanding. An addition will be built 277 ft long and 150 ft. wide, 1 story high with basement, and saw-tooth roof. According to plans made this addition will be completed by July 1 and 700 looms installed, making the total equipment 25,920 mule spindles, 44,800 ring spindles and 2,000 looms. The B. F. Smith Construction Co. has the contract for construction work.

Massachusetts, New Bedford. At a meeting of stockholders of the Bristol Mfg. Co. it was voted to increase the capital stock from $800,000 to $1,000,000 by the issue of 2,000 shares, par value $100. The additional capital is to be used for working capital and to make some changes or additions to the present equipment.

Massachusetts, Salem. The Naumkeag Steam Cotton Co. is replacing old boilers with eight vertical boilers of the latest pattern, each of about 200 h. p. This improvement will be completed by the first of July.

New Hampshire, Nashua. The Nashua Mfg. Co. will build an 8-story brick storehouse, 200 by 100 ft., to be used wholly for the storage of raw cotton. The capacity will be about 18,000 bales. A blowing system is to be installed to convey the cotton from the storehouse to the main mill.

*New Jersey, Passaic. Following the report that the Passaic Cotton Mills would increase their power equipment, announcement is made that a $30,000 addition is to be built.

New York, Clark Mills. An addition is being built to the main mill of the Hind & Harrison Plush Co., to be used for finishing and shipping purposes. The enlargement is to be 225 ft. long and 4 stories high.

*New York, New York Mills. The new bleachery for the New York Mills, on which work has just been started, will be 2 stories high and approximately 180 ft. square, of brick with gravel roof, and will cost in the neighborhood of $45,000.

North Carolina, Bessemer City. About $75,000 will be spent by the Osage Mfg. Co., which succeeded the Slater Mfg. Co. in the operation of the Southern Cotton Mills, for new machinery equipment, including the change from steam to electric power.

*North Carolina, Concord. The Young-Hartsell Mills Co. will build the weaving department contemplated early in the year and have prepared plans for a building 75 by 136 ft., to be equipped with 200 looms. This will enable them to weave the yarns produced on the present equipment of spinning machinery.

*North Carolina, Mount Holly. The addition to be built during the summer for the Nims Mfg. Co. will be used for baling and packing and for storage room. This will give additional room for other operations and new machinery will be installed eventually, but particulars have not been decided at present.

*North Carolina, Rockingham. The Hannah Pickett Mills have awarded contract to T. C. Thompson & Bro. of Birmingham, Ala., for the construction of their addition. The enlargement will be 100 by 235 ft., and is to be equipped with 400 Northrop looms.

North Carolina, Troy. A new napper, tenter machine and a press have been installed in the finishing department of the Smitherman Cotton Mills.

*Rhode Island, Warren. New Saco & Pettee cards and drawing machinery and Whitin spinning and twisting frames are being installed in one of the mills of the Cutler Mfg. Co., and engine and boilers are being inspected and overhauled. They expect to begin manufacturing cotton yarn within two months. The other mill will not be started for six or eight months and when it is put in operation will be on a special line of woven goods. Within a year they expect to have the entire plant running in full and will then have 45,000 spindles. John H. Estes is president; Rufus P. Walker is treasurer and will also look after the manufacturing.

*South Carolina, Gaffney. It has been decided to carry out the plan for enlarging the Hamrick Mills, which was announced last December. A 2-story, 250-foot addition will be built and equipped with 15,000 ring spindles and 364 40-inch looms. The company has awarded contracts for the enlargement and construction work will be started within a week or ten days. The cost is estimated from $250,000 to $275,000. The present equipment is 10,240 ring spindles and 260 broad looms for the manufacture of sheetings.

*South Carolina, Rock Hill. The addition to the weaving department of the Manchester Cotton Mills is to be completed and in operation by October 1. As noted previously, 100 new looms will be installed.

South Carolina, Rock Hill. Another addition will probably be built for the Hamilton Carhartt Cotton Mills and plans have been prepared by Jones & Walker of Rock Hill. This company makes cottonades, denims and shirtings, using the product at their Detroit, Mich., factory.

Mills Starting Up.

North Carolina, Rutherfordton. It is expected the Cleghorn Mills Co., incorporated late in 1909 to take over and operate the Levi Cotton Mills, will begin manufacturing about May 1. A quantity of new machinery is now being set up.

Virginia, Roanoke. T. T. Fishburn of Roanoke and W. J. Ruffin of Mayodan, N C., have bought the plant of the Roanoke Mills Mfg. Co. This mill has not been in operation for some time, but will be started up as soon as possible by the new owners, who have organized the Twine Mill Corporation. T. T. Fishburn is president and W. J. Ruffin, general manager. The Roanoke Mills Mfg. Co. have equipment of 6,000 ring spindles on which white and colored twines, cable and seine cords and similar goods were manufactured.

Mills Shutting Down.

New York, Pleasant Valley. The Pleasant Valley Cotton Mills, Garner & Co.'s local plant, are shut down and it is reported will not be started up again until disposed of.

North Carolina, Rockingham. The Hannah Pickett Mills have shut down indefinitely owing to the large supply of yarn on hand. During the shutdown, work will be pushed forward on a new weave room, which will cost about $100,000.

WOOLEN.

New Mills.

New York, Poughkeepsie. Joseph Jaggers, formerly manager of J. W. Dimick Co., at Rifton Glen, N. Y., has leased a brick building on S. Water St. and will equip it for the manufacture of Brussels, Wilton, velours and other carpets. He has secured a patent on a device for perfecting the manufacture of these goods.

New York, Salamanca. The Ashworth & Odell Worsted Co. and Abraham Ashworth's Sons have decided to move here from Jamestown, N. Y., and will build a mill about 150 ft. long, 80 ft. wide and 2 stories high, to be equipped for manufacturing worsted yarns. The business of these two concerns will be conducted separately as in Jamestown. The town is providing a suitable factory site on the Erie Railroad and giving a bonus of $10,000.

Enlargements and Improvements.

*Connecticut, Stafford Springs. In the building now under construction, the Warren Woolen Co. plans to provide space for dye house, boiler house, preparation of stock, dressing and twisting. The addition is to be 2 stories high, 160 by 60 ft.

*Indiana, La Porte. Nothing has been definitely decided in regard to enlargements proposed by the Wallace & Smith Co. At present they operate 10 sets of cards and 44 looms on horse and bed blankets Wm. H. Wallace is president and treasurer, and Robt. F. Wallace, agent and buyer.

*Maine, Sanford. Mill K of the Goodall Worsted Co. is practically completed and new machinery is being installed as fast as received.

Massachusetts, Clinton. The Victor Mfg. Co. has installed woolen yarn machinery and will in the future make all their own yarns, both for woolen and worsted goods.

Massachusetts, Franklin. An addition, 75 by 35 ft., is being built by the Franklin Yarn Co. It is reported they will install a new 150-h. p. boiler, a rag picker and 6 shoddy cards.

Massachusetts, North Chelmsford. The Silesia Worsted Mills, formerly the Moore Spinning Co., are installing new worsted machinery, some of which is from the Lowell Machine Shop and some iimported from England.

Massachusetts Smith's. New drying machinery is being set up in the Swift River Co.'s mill.

Massachusetts, Uxbridge. New machinery is being installed in the carding room, spinning room and weaving department of the Stanley Woolen Co., replacing old equipment. Arthur Wheelock is president and treasurer and Stanley H. Wheelock is superintendent.

New Hampshire, Enfield. It has been decided to build the proposed addition to the Baltic Mills (American Woolen Co.) to increase the capacity of the spinning department.

New Jersey, Passaic. A large addition is being built for Forstmann-Huffmann Co., 3 stories high at one end and 5 stories high at the other. It is estimated $30,000 will be expended for the building.

New York, Albany. Work has been started on addition, 60 by 100 ft., to the felt plant of F. C. Huyck & Sons. It is expected the enlargement will be finished by July 15.

*New York, Jamestown. The Cleveland Worsted Mills Co. has decided to install at least 10,000 spindles for Bradford worsted spinning and 5,000 spindles for French spinning in the new Odsonia Worsted Mills. There will also be some looms installed, as noted previously, possibly 100. The Cleveland Worsted Mills Co. owned the machinery in the Chadakoin Worsted Mills, which were destroyed by fire recently. It is understood this mill will be rebuilt by the owners, but will not be equipped again by the Cleveland Worsted Mills Co.

New York, Malone. The Lawrence Webster Co. has bought the property known as the Kelly Mill with water privileges and will take possession July 1. According to a local report, the capacity of the Lawrence Webster Co. is to be largely increased, but the company will make no statement in regard to this. They manufacture wool cassimeres, operating 3 sets and 14 looms.

New York, Newburgh. Wm. Crabtree & Sons have bought land on South Williams St., 166 by 238 ft., on which they will build a mill. Plans have not been made as yet, but this matter will be attended to at once, as they expect to occupy the proposed building before May 1, 1911, when the lease on their present quarters expires.

Pennsylvania, Chester. Additional carding machinery is being installed by the Irving & Leiper Mfg. Co., manufacturers of warps and hosiery yarns.

*Pennsylvania, New Cumberland. Six new looms will comprise the equipment of the addition which was started April 1 for the Susquehanna Woolen Co. They manufacture blankets.

Pennsylvania, Philadelphia. The Prudential Worsted Mills now at Wayne Junction, who recently purchased the large mill at Orthodox and Large Sts., Frankford, report that they are now arranging for the removal of their plant to that location. They will consolidate their branch mill at Howard and Huntingdon Sts. with the main plant, and operate 104 looms on woolen and worsted dress goods and men's wear.

THE COVINGTON (GA.) COTTON MILL. J. W. WORSHAM, SUPERINTENDENT.

Pennsylvania, Philadelphia. The Germantown Worsted Mills, which have been located at 240 Ashmead St., have been removed to the Cope Mills at Wayne Junction, where more room has been secured to enable them to increase their plant. They are now making cotton and woolen men's wear on 24 looms with R. Kennedy as superintendent. The production is sold direct.

Pennsylvania, Philadelphia. Joseph D. Swoyer & Co., Inc., spinners of woolen and merino yarns for the weaving and knitting trade at Howard and Berks Sts., have increased their equipment by the addition of another set, and are now operating 5 sets and 3,000 spindles to their fullest capacity. The office of the company is at 207 Mariner & Merchant Bldg.

Pennsylvania, Philadelphia. The Oxford Plush

Mills, of which Albert Waterhouse is the proprietor, located at 110 W. Oxford St., have recently installed four new looms on which they are manufacturing worsted dress goods and serges, in addition to plushes. Both products of the plant are sold direct.

Pennsylvania, Philadelphia. E. W. Goodman & Co. are removing their Kingston Mills, in which they manufacture carpets on 22 narrow looms at Front and Lehigh Ave. to Bromley's Mill at Jasper and Adams Sts., where they have secured larger quarters.

Pennsylvania, Philadelphia. Ferdinand Binz & Son, who have been located at Allegheny Ave. and A Sts. for some years, have removed their plant to larger quarters at Coral and Adams Sts., where they are manufacturing Granite, ingrain and jute carpets on 38 looms.

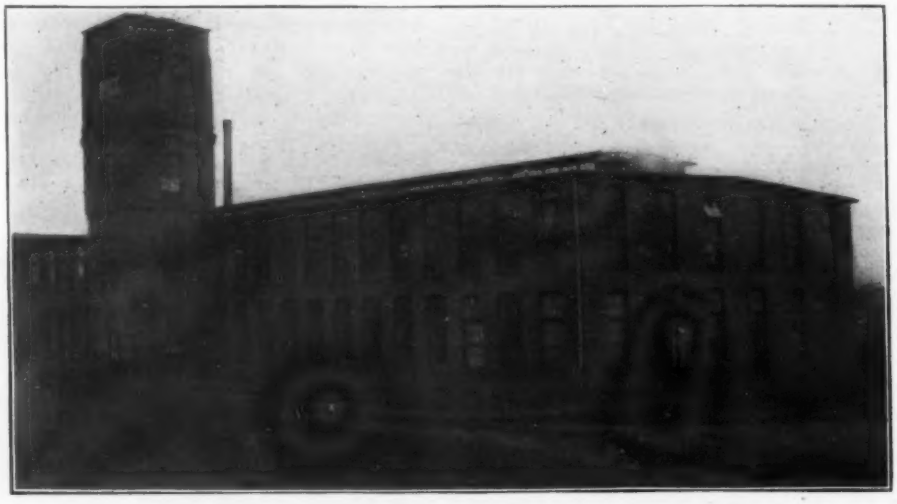
Rhode Island, Woonsocket. Work has been started on the addition to be erected for the Jules Desurmont Worsted Co. As noted previously, the foundation for this structure was completed when the other half of this mill was built.

Virginia, Winchester. The Winchester Woolen Mills, C. A. Williams & Bros., proprietors, have ordered a new 75-h. p. engine to be delivered within sixty days. Additional machinery is to be installed later.

*Wisconsin, Milwaukee. Construction work has been started on the addition for the Western Worsted Mills, which when completed will be 2 stories high, 40 by 132 ft. Part of the equipment to be installed will be 24 new looms. This company has been very successful since taking over the plant of the Kassman Mfg. Co. and has increased the plant from 16 looms to 40 looms. A high grade of worsted men's wear is the sole product. F. M. Weinhold is president and buyer; W. G. Hays, treasurer, and John Viehs, superintendent. The plant includes a steam power plant, dye house for piece dyeing and complete finishing department.

*Wisconsin, Racine. The new looms installed by the Racine Woolen Mills, Blake & Co., cover all the increase that is planned for the present time. Business is excellent, and they have voluntarily raised the price for weaving one-half cent per yard.

Wisconsin, Sheboygan Falls. The Brickner Woolen Mills Co. have installed 4 new Crompton & Knowles looms.



THE MARY-LEILA COTTON MILL, GREENSBORO, GA.

Mills Starting Up.

California, Eureka. In the near future the Humboldt Bay Woolen Mills, which have been idle for several months, will resume operations.

SILK.

New Mills.

Massachusetts, Holyoke. Florence Donoghue, a stockholder in the Goetz Silk Mfg. Co., and a member of the grocery firm of F. & P. Donoghue, is interested in locating a new silk mill in a mill building on Cabot St., which will make silk linings and taffetas. A Mr. Myers is also interested in the project.

*New York, Waverly. The new Waverly Silk Ribbon Co. will build a mill on the Ferris Wright property next to the Hall & Lyon furniture factory. Twelve thousand dollars has been invested by residents of Waverly. The new company is controlled by the Hartley Silk Mfg. Co., 483 Broome St., New York, who have mills at Sidney, New York and Topton, Pa.

Personals.

Joseph McGowan has accepted the position as second hand in the card room at the Bound Brook Woolen Mills, Bound Brook, N. J. He comes from Passaic, N. J.

John P. Tait has been appointed overseer of the wool scouring, blending and picking departments at the Bigelow Carpet Company, Lowell, Mass.

A. R. Eller has accepted a position as carder and spinner at the Anchor Duck Mills, Huntersville, N. C. He comes from China Grove, N. C.

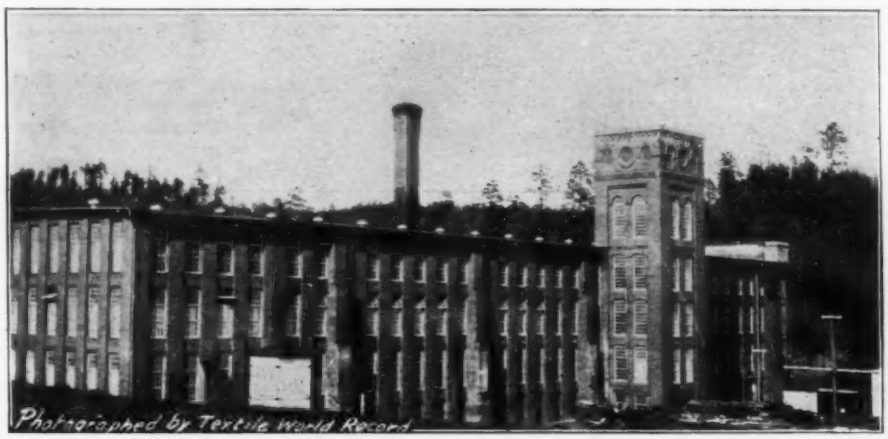
J. S. Drake, formerly overseer of spinning at Lancaster, S. C., has accepted the superintendency of the Lockmore Mill, Yorkville, S. C., where he succeeds J. D. Boseman.

Charlie Fisher has accepted a position as overseer of dyeing at the Manetta Mills, Lando, S. C. He comes from Charlotte, N. C.

James Jackson, assistant overseer of warping and spooling at the Eclipse Mills, North Adams, Mass., has accepted a position as overseer of the slashing and drawing-in departments at the Gosnold Mills, New Bedford, Mass.

John Oldfield, overseer of finishing at the Tremont Worsted Company, Methuen, Mass., has been appointed boss finisher at the new Ayer Mill, Lawrence, Mass.

P. T. Donahoe has been appointed overseer of



THE COURTENAY MFG. CO.'S MILL AT NEWRY, S. C. W. E. CHESWELL, SUPERINTENDENT.

G. F. Howard has accepted a position as overseer of the spinning room of Mill No 2, Lancaster, S. C.

G. W. Lamar has been promoted from the position of overseer of beaming to superintendent of the Nantucket Mills, Spray, N. C.

J. W. Greer, of the Franklin Mills, Greers, S. C., has resigned his position there to accept a position as overseer of carding at one of the mills at Greenwood, S. C.

S. G. Touchstone, overseer of carding at the Union Cotton Mills, Lafayette, Ga., has resigned and is to accept a similar position with the Fulton Bag & Cotton Mills, Atlanta, Ga.

Thomas Haskell, overseer of spinning at the Columbus Mfg. Company, Columbus, Ga., has resigned to accept a similar position at the Warren Mfg. Company, Warrenville, S. C.

W. H. Ramsey, night overseer of spinning, spooling, twisting, warping and winding at McColl Mill, No. 4, has resigned.

finishing at the Wuskanut Mills, Farnumsville, Mass., succeeding J. W. Rensehausen.

George Dawson has accepted the position as superintendent of the Angus Park Mfg. Company, East Glastonbury, Conn., to succeed J. L. Jackson.

John Menzies, overseer of carding at the Tilton Woolen Mills, Tilton, N. H., has severed his connection with that company.

Wm. Holt, overseer of mule spinning at the Lawton Spinning Company, Woonsocket, R. I., has severed his connection with that company.

James O. Thompson, agent of the New Bedford Cotton Mills Corporation, has been selected to fill the vacancy which will be created at the Grinnell Mfg. Company when John Neild severs his connection with that concern to take charge of the Neild Mill.

Arthur M. Whitley has accepted the position as overseer of drawing at the Nornay Worsted Company, South Barre, Mass. He comes from Lawrence, Mass.

John Lucey has accepted a position as overseer of carding at the H. T. Murdock & Company, Proctorsville, Vt. He comes from Franklin, N. H.

Frank W. Scribner, assistant superintendent at the Elmdale Mills, Uxbridge, Mass., for the past four years, has resigned and is to accept a position as assistant superintendent and designer at the Hecla Mills, American Woolen Company, same town.

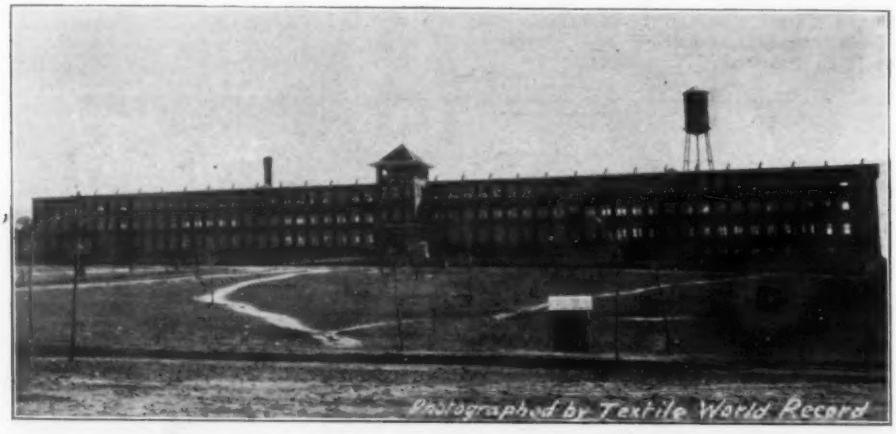
Thomas Hannon, superintendent of the yarn department at the Jno. K. Stewart & Sons' Mill, Amsterdam, N. Y., has severed his connection with that company to accept a similar position with the Troy Knitting Company of Cohoes, N. Y.

Winooski, Vt. He comes from East Rochester, N. H.

Patrick Cunningham has accepted a position as overseer of dyeing at the Garland Mills, Staffordville, Conn. He comes from Rockville, Conn.

George H. Norton has accepted a position as overseer of dyeing at the Uncasville Mfg. Company, Uncasville, Conn. He will have charge of the dyeing department of the Uncasville, Pequot and Versailles Mills.

Arthur R. Dickinson, overseer of carding at the Merchants Mfg. Company, Fall River, Mass., has been appointed superintendent of the Nonquit Mfg. Company, New Bedford, Mass.



THE SHAWMUT MILL AT SHAWMUT, ALA. GEORGE W. MURPHY, SUPERINTENDENT.

Thomas Browning has accepted the position as overseer of ring spinning at the Gosnold Mills, New Bedford, Mass. Amos Gee has accepted a position as overseer of the cloth room at the same company.

Arthur O. Roberts, formerly superintendent of the cotton spinning department at the Amoskeag Mfg. Company, Manchester, N. H., has been appointed assistant superintendent in the worsted department. Winthrop Parker succeeds Arthur O. Roberts as superintendent of the cotton spinning department.

John Murphy has accepted the position as overseer of the cloth department at the Danielson Cotton Company, Danielson, Conn. He succeeds Simon Goyette, who has accepted a similar position at the Clinton Mills, Woonsocket, R. I.

Michael Sheahen, for the past four years overseer of the weaving department at the Samoset Mills, Valley Falls, R. I., has resigned to accept a position as superintendent of the Sherman Mill. Danielson, Conn.

Geo. A. Elliott has accepted the position as overseer of spinning at the Burlington Mills.

Wm. Atkinson, overseer of spinning at the Smith & Dove Mfg. Company, Andover, Mass., has resigned to accept a similar position with the Columbia Cordage Company, Auburn, N. Y.

Arthur Davidson has been appointed assistant superintendent of the Elmdale Mills, Uxbridge, Mass., to succeed Frank Scribner.

Charles G. Stratton, president and treasurer of the Curtis Mfg. Company, Worcester, Mass., on his retirement distributed seven thousand dollars among a hundred employes for faithful service.

Joseph Tardy, overseer of finishing at Mayo & Sons, Inc., Foxcroft, Me., has resigned to accept a similar position with the Dumbarton Woolen Mills, Dexter, Me.

James Adamson has accepted the position as overseer of burling and sewing at the Strathmore Worsted Company, Concord Junction, Mass. He comes from Maynard, Mass.

Alfred Bresette has been appointed overseer of weaving at the Paragon Worsted Company, Woonsocket, R. I. He comes from Harrisville, R. I.

James Jamieson has accepted the position as overseer of spinning for McLeary, Walling & Crouse, Amsterdam, N. Y.

Louis Prendergast, overseer of carding for Dexter, Richards & Sons' Company, Newport, N. H., has severed his connection with that company.

George L. Cogswell has accepted the position as overseer of finishing at the Namquit Worsted Company, Bristol, R. I. He comes from Philadelphia, Pa.

T. Edward McDermott has accepted the position as overseer of finishing at the Edward T. Steel & Company's mill, Bristol, Pa. He was formerly employed at the Arden Mills, Fitchburg, Mass.

Robert A. Bain, overseer of spinning at the Stanley Woolen Company, Uxbridge, Mass., has resigned to accept a similar position with the Beaver Brook Mills, American Woolen Company, Collinsville, Mass.

Alden Morse, overseer of weaving at the Powhatan Mill, Putnam, Conn., has severed his connection with that company.

J. H. Fairbrother, overseer of carding at the Great Falls Woolen Company, Somersworth, N. H., has severed his connection with that company.

J. F. Porter of Atlanta, Ga., who has been associated with the American Moistening Company for the last sixteen years in connection with their

THE NEW CONCRETE MILL OF THE LEWIS KNITTING CO., JANESVILLE, WIS.

Chas. Steadman, overseer of dressing at the Sheridan Woolen Mills, Ashuelot, N. H., has severed his connection with that company, and is succeeded by Abraham Warren, who comes from Newport, N. H.

C. A. Williamson has been appointed overseer of finishing at Mayo & Sons, Inc., Foxcroft, Me. He comes from Dracut, Mass.

T. H. Driscoll has accepted the position as overseer of dyeing at the Bradford Mills, Germantown, Philadelphia, Pa. He comes from the Princeton Worsted Mills, Trenton, N. J., and succeeeds George Wilman.

Ariel C. Thomas has been appointed agent of the Grinnell Mfg. Corporation, New Bedford, Mass. He was formerly agent of the Boott Mills, Lowell, Mass., and at one time superintendent of the Clinton Mfg. Company, Woonsocket, R. I.

H. Q. Thompson has accepted the position as overseer of weaving at the Abbott Mills, Dexter, Me., succeeding Eugene Merchant.

southern department, has beeen appointed their Southern Representative, with headquarters at Charlotte, N. C., succeeding Mr. J. S. Cothran, who retires on account of other interests which require his entire attention. Mr. Porter has been long and favorably known throughout the South, and his many friends will be pleased to congratulate him on his new position.

Joseph T. Leach, superintendent of the Arkwright Mills, Fall River, Mass., has severed his connection with that company. He is to take the position of superintendent of the Durfee Mills, succeeding the late Joseph H. Potter.

A. A. Brainerd, overseer of carding at the Bristol Mill, New Bedford, Mass., for the past seven years, has resigned to accept a similar position at the new Nashewana Mill, New Bedford.

David B. Hart has accepted the position as overseeer of finishing at the Pawcatuck Woolen Mills, Westerly, R. I., succeeding Walter Gledhill.

O. B. Sawyer, overseer of finishing at the Dumbarton Woolen Mills, Dexter, Me., has severed his connection with that company.

S. E. Crowthers has accepted the position as overseer of dyeing at the Arden Mills, Fitchburg, Mass. He comes from Allentown, Pa.

R. R. Cairns has been appointed superintendent of the Lebanon Woolen Mills, Lebanon, Tenn.

John Wilkinson has been appointed overseer of weaving at the Northern Ohio Blanket Mills, Cleveland, O. He was formerly employed at the Wuskanut Mills, Farnumsville, Mass., but more recently with the Draper Company setting up machinery.

Gilbert J. Carter, superintendent of the spinning department at the Bigelow Carpet Company, Clinton, Mass., has severed his connection with that company. He is succeeded by his assistant, T. J. Firth.

Napoleon Goyette has accepted the position as overseer of the cloth room at the Clinton Mfg. Company, Woonsocket, R. I. He was formerly employed at the Danielson Cotton Mills, Danielson, Conn.

Wm. C. Wilcox has been appointed manager of the Chicago branch of the Reeves Pullev Co. He has been connected with this branch of the concern for a number of years and is receiving the congratulations of his many friends on his promotion.

A. S. Wells, superintendent of the Gallia Silk Mills, South Bethlehem, Pa., has resigned to accept a position with D. G. Dery, Catasauqua, Pa., lately vacated by Mr. Seltmann.

J. S. Drake, superintendent of the Lockmore Mills, Yorkville, S. C., who recently invented a traveler magazine, is a graduate of the textile department of the North Carolina A. & M. College. Mr. Drake graduated three years ago and after graduating was appointed overseer of spinning at the Lancaster Cotton Mills, Lancaster, S. C.

J. B. Moore has been appointed superintendent of the Belmont Cotton Mill, Shelby, N. C. He comes from Opelika, Ala.

W. C. Allen has accepted the position as overseer of weaving at the Delta Cotton Mills, McComb City, Miss. He comes from Clifton, S. C.

J. D. Wallace has accepted a position as overseer of weaving and beaming at the Nantucket Mills, Spray, N. C.

Roland V. Thomas has accepted the position as overseer of carding with Johnson & Johnson, Red Cross Mill, New Brunswick, N. J.

W. J. Heath has been appointed overseer of spinning at the Waxahachie Cotton Mills, Waxahachie, Tex. He comes from Dallas, Tex.

Geo. J. Barry has been appointed master mechanic at the Merrimac Hat Company, Amesbury, Mass. He was formerly employed by James & E. H. Wilson, Pittsfield, Mass.

James T. Cullen, designer at the Assabet Mills, Maynard, Mass., has severed his connection with that company.

Archie W. Couper has been appointed superintendent of the Warwick Mills, Centreville, R. I. J. T. Ferguson has been promoted to the position of agent of this company.

Joseph Keighley has accepted the position of designer at the Beebe-Webber Company, Holyoke, Mass. He comes from Pawtucket, R. I.

Walter Pine, overseer of weaving at the Schuster Woolen Company, East Douglas, Mass., has severed his connection with that company to accept a similar position at Worcester, Mass.

Moses Barber has accepted a position as overseer of carding for Kenyon & Woodbury, Wyoming, R. I. Mr. Barber was formerly employed at Monson, Mass., and previous to that time at Potter Hill, R. I.

Charles H. Savage of Bradshaw, Md., and formerly connected with the Franklin Mills, has succeeded Gustavus B. Timanus, who for many years has managed the local plant of the cotton duck company at Laurel, Md.

William Brierly, who has been second hand in the mule spinning department at the Ponemah Mills, Taftville, Conn., has been appointed overseer of the mule and ring spinning at Ballouville, Conn.

L. S. Clark, overseer of weaving at the Carleton Mills, Sangerville, Me., has severed his connection with that company.

Florence McCrohn, second hand in the carding department at the Faulkner Mills, Stafford, Conn., has resigned to accept a similar position at the Riverside Mills, Stafford, Conn.

Frank W. Hesseltine has been appointed overseer of weaving at the Monadnock Mills, Claremont, N. H., to succeed R. Young.

J. W. Howard, for several years overseer of spinning at Ballouville, Conn., has resigned to accept a similar position at Kankakee, Ill.

J. B. Bennett has accepted the position as overseer of dyeing at the Paragon Worsted Company, Woonsocket, R. I., succeeding J. F. Bresett.

James F. Shea has accepted a position as overseer of spinning at the Ray Mills, American Woolen Company, Franklin, Mass. He comes from Monson, Mass., and succeeds Wm. Kirby.

Arthur Goulet, overseer of ring spinning at the Hebron Mfg. Company, Hebronville, Mass., has severed his connection with that company. He is succeeded by Oscar Bouregault, of Claremont, N. H.

Matthew W. Kohlrausch, overseer of dyeing at the Talbot Mills, North Billerica, Mass., for the past 25 years, has severed his connection with that company. He is succeeded by Jos. Schiffers, who was formerly employed at Knoxville, Tenn.

George R. McDougall, superintendent of the Cohankus Mfg. Company, Paducah, Ky., has severed his connection with that company.

Wm. E. Tobin has been engaged as second hand in the dyeing department at the Princeton Worsted Company, Trenton, N. J. He comes from Holyoke, Mass.

Julius Bernhard, who has been designer at the Middlesex Company, Lowell, Mass., has been appointed designer at the Princeton Worsted Mills, Trenton, N. J.

D. F. Malone has accepted a position as second hand in the carding department at the Franklin Mill, Franklin, N. H. He comes from Lebanon, N. H.

Wm. E. Chamberlain has accepted the position as overseer of finishing at the Concord Mfg. Company, Penacook, N. H. He comes from the C. A. Root Company, Uxbridge, Mass.

Albert Forward has accepted the position as overseer of carding at the South Acton Woolen Company, South Acton, Mass. He comes from the Basch & Greenfield Company, Newark, N. J.

DEATHS.

David Hambleton, for many years prominently identified in the manufacture of bobbins for textile mills, died at Adams, Mass., of cerebral paresis. He was born in Derbyshire, Eng., and was the inventor of several devices in the bobbin industry. He was interested in bobbin mills in Masoma, Gulfstown and Lunenberg, Vt.

Joseph H. Potter, Jr., died at his residence on Hanover St., Fall River, Mass., at the age of 43 years. He was the eldest son of Jos. H and Elizabeth Potter. He went to Fall River with his parents in 1872 and worked in the frame spinning department at the Davol and Globe Yarn Mills. He also worked at the Sagamore Mfg. Company as second hand in the frame spinning department and later became overseer. When the No. 1 Sagamore Mfg. Company was rebuilt he started up the frame spinning department. In November, 1891, Mr. Potter went to the Durfee Mills as superintendent and held that position up to the time of his death. He is survived by a wife, three sons and a daughter.

George P. Ladd, formerly a woolen manufacturer of Spencer, Mass., died in New York, March 23, of heart disease. He was born in Sturbridge, Mass., in 1838. He went into the woolen business in 1866, but had recently been department manager for the Standard Oil Company.

Wm. Hendee, at one time superintendent of Cheney Bros.' silk throwing department at Manchester, Conn., died at Kingston, N. Y. His body was brought to Manchester for burial. He is survived by one son.

J. B. Winpenny, widely known as a woolen manufacturer, died at his home, 1432 N. Broad St., Philadelphia, of pneumonia, at the age of 71 years. He was born in that city in 1838 and succeeded his father as owner and operator of a large mill at the Falls of Schuylkill.

Hon. Warren O. Arnold died at the Dickson House, Westerly, R. I., after a few days' illness. With his brother, Louis W. Arnold, they owned and operated the Westerly Woolen Company. His home was at Chepachet, R. I. He was the son of Otis Whitman and Carolina M. Sweetser Arnold and was born June 13, 1839, at Coventry, R. I. He remained there until he was seven years of age and later moved to Voluntown, Conn. He then went to Chepachet, R. I., where he was operator in a mill for several years and afterwards accepted a position at Mapleville, R. I.

Robert E. Monckton, overseer of weaving at the Brampton Woolen Company, Newport, N. H., died March 29 of pneumonia after two weeks' illness.

Alfred Downing, a pioneer in the manufacture of cotton cloth and who operated a mill at Readville, Mass., some years ago, died recently of old age.

James L. Ballantyne, a native of Southbridge, Mass., and who had resided in Hudson about fourteen years, being associated with Henry T. Dyson in the Hudson Worsted Company, commission wool combers, died April 9 at the age of 71 years. He leaves a wife and two daughters.

David Buck died at his home in Saco, Me., at the age of 83 years. His death was not unexpected, as he had been failing for some time. He was overseer of weaving some years ago at the Pepperell Corporation, and resigned to enter into the hardware business of that town. He is survived by one son and a sister.

Hon. Alphonso F. White, superintendent of the Forestdale Mfg. Company, Forestdale, R. I., and formerly state senator from North Smithfield, R. I., died April 9 at the Woonsocket Hospital following an operation for appendicitis. He leaves a widow and two daughters.

John C. Miller, a native of Scotland and a retired knit goods manufacturer of Amsterdam, N. Y., died suddenly April 18 at the of 82 years. In addition to the knit goods business he had also been interested in the manufacture of brooms and in the contracting business in Amsterdam. He is survived by two daughters.

News has just come to hand of the sudden death, through heart failure, of Mr. H. Alban Ludwig, of the firm of H. Alban Ludwig, Hosiery Machines Factory, Chemnitz, Germany. Mr. Ludwig was 60 years of age.

He started in business in 1880 employing only a few hands, but through perseverance and pronounced capability, he developed it to a great extent, and the factory employs today over 500 hands. Mr. Ludwig has invented many patents and improvements on hosiery machines and was considered one of the best authorities in this industry.

Though the firm experiences a very great loss by his decease, business will, however, be continued as heretofore by his two surviving sons, Messrs. Max and Curt Ludwig, the latter of whom is at present in this country.

New Publications.

[Any work noticed under this head can be obtained through the office of this journal.]

Artificial Silk and its Manufacture (La Soie Artificielle et sa Fabrication); by Joseph Foltzer; Charles Girompaire, Vosges, France. Price, $4.00

This is the second edition of a work that first appeared several years ago, the first edition being quickly sold out, and for some time the book has been out of print. The author has now brought it up-to-date in the second edition, which contains numerous excellent illustrations of the artificial silk filament, the cotton fiber and the apparatus employed in the manufacture of artificial silk. The sale of the first edition of this work was forbidden in Germany by the German Government, because it revealed secret processes of manufacture and gave information regarding the technical operations of manufacturing artificial silk as employed in that country.

The author is a chemist who has had charge of all the processes which he describes. He begins with a chapter on the general properties of cellulose from which artificial silk is made and then follows with a detailed account of the different processes and apparatus for manufacturing artificial silk. He gives a description of an artificial silk mill, with a statement of the cost of installation and of the cost of manufacturing the silk. This is the information which brought him in conflict with the German Government. The text is in French.

A Technical Cyclopedia (Lexikon der Gesamten Technik); by Otto Lueger and associates; Deutsche Verlags-Anstalt, Stuttgart, Germany; complete in 40 parts. Price, $1.00.

We have received parts 38, 39 and 40, which completes this elaborate technical lexicon. The work has been compiled by Herr Lueger, with the assistance of a numerous staff of specialists in different departments. The work is exhaustive and the value is greatly increased by the excellent illustrations.

Cost Accounting Pathfinder; by Frank E. Goodwin, Associate Editor of Farm Machinery; Midland Publishing Co., St. Louis, Mo. Second edition.

The fundamental principles underlying cost accounting are the same in all kinds of business. This is why even the textile manufacturer and merchant will be able to obtain valuable hints from the Cost Accounting Pathfinder, which deals with the general phases of the subject. An idea of the scope of the work may be obtained from the following abstract of the contents: Fixed expenses defined and classified, inventory and stock taking, a simple cost accounting system; a perpetual inventory, profits by departments, perpetual inventory, explanations of invoicing.

Business Literature.

Eight Hundred Users of Humidifiers; The American Moistening Co., Boston, Mass.

This is a list of 800 users of the American Moistening Co.'s system of humidifiers. Nothing is more convincing as to the merit of an apparatus than satisfied users, and when these number 800 in every part of the country who have had the apparatus in successful operation for many years, the evidence becomes overwhelming.

The Tillotson Humidifiers; Schumaker & Santry, 141 Milk St., Boston, Mass., General Sales Agents.

A very attractive pamphlet of 25 pages giving an illustrated account of the Tillotson humidifier, the invention of Marshall Tillotson, and for which the general sales agents are Schumaker & Santry, 141 Milk St., Boston, Mass. The pamphlet gives an account of the origin of the humidifier in the mohair and alpaca mills in Providence, R. I., and its gradual extension to other fields. The principle of the humidifier is very clearly explained by the aid of illustrations and drawings. There are also views of various workshops in which the humidifier has been installed.

Parks' Piping Parables; The G. M. Parks Co., Fitchburg, Mass.

The April issue of this interesting publication contains a great deal of wisdom in the form of aphorisms and short paragraphs dealing with a variety of subjects. Incidentally the publishers call attention to a number of specialties manufactured by them, including the Cochrane separators, the 4/S Money Back steam trap, and the glass gauge cutter. A description of a number of pipe fittings call attention to this branch of the company's business.

Water Purification Facts for Steam Users; The Wm. B. Scaife & Sons Co., Pittsburg, Pa.

This is a paper read before the Rochester, N. Y., Engineers' Club on February 25. It is a very careful study of the question based on practical experience with the steam boiler. We advise every steam user to obtain a copy.

Knitting Machinery. The H. Brinton Co., 213 Race St., Philadelphia, have brought out a new catalogue of their line of full automatic seamless hosiery machinery, as well as circular ribbed knitting machinery for making hosiery, underwear, sweaters, tcques and specialties.

In the introduction they call attention to the fact that during the year 1909 the volume of business done by this company was double that of the previous year and that in the 22 years that they have been in business nearly 25,000 knitting machines of their make have been marketed.

The catalogue, which is beautifully gotten up, illustrates and describes each machine, gives details about it, tells what it is particularly adapted for, gives details of weights, measurements, speed and contains several tables, particularly one showing the number of needles to the inch and the gauge of needles used in the cylinders of seamless knitting machines.

Manufacturers or knitters who have not received a copy of this catalogue should send for one.

Humidlty Reference Table.

The G. M. Parks Co., Fitchburg, Mass., builders of "Turbo Humidifiers," have prepared a valuable quick reference table which shows the relative humidity and grains of moisture per cubic foot of air for various dry and wet bulb temperatures. It is of handy pocket size and printed on three celluloid tablets, which are practically indestructible. It is a very neat thing and convenient for handy reference. Those interested in the subject of humidity will find this device very useful, whatever system of moistening is employed. It can be had without cost by writing to the G. M. Parks Co. and referring to the Textile World Record.

New "American" Steel Pulleys.

Twelve years ago, when an American inventor planned the first steel pulley, he thought his idea would revolutionize a trade, create a new standard and that his invention would find its way to every civilized country on the globe. It was the great oak arising from the little acorn, so typical in American business life.

Among the reasons for "American" steel pulleys being so well liked, are that they are 45 per cent. lighter than cast iron pulleys of the same size, are safe at high speeds, and without danger of bursting destructively. They are made on clean and compact lines, which get the best results possible. The many users of this excellent specialty, as well as the trade in general, will hear with interest that the makers have added to their line a range of new diameters from 50 to 60 inches inclusive. These new sizes embody all the leading points of mechanical excellence which have made the lesser diameters so well liked, with the exception that for strengthening purposes the larger diameters have eight arms instead of the usual six.

Over two hundred thousand pulleys of different sizes are now turned out annually by The American Pulley Company. A particularly gratifying feature of their business expension is the steady conquest of the various foreign markets, as evidenced by the recent heavy orders from such countries as India, Egypt, Australia and the Philippines.

There is now ready a new general catalogue, which is sent gratis to all inquirers, and the manufacturers solicit inquiry correspondence, which receives sharp attention in a special department for the purpose.

Bellicosa Softener.

Calico printers and dyers are advised to test the new softener brought out by the Arabol Mfg. Co., 100 William St., New York. They call it Bellicosa softener and claim for it greater economy, more convenient handling and better results in comparison to other articles. It comes in the form of a powder which in boiling water will dissolve in three minutes, ready for mixing.

*Michigan, Bay City. Construction work has been started on the World's Star Knitting Co.'s new mill.

Spun Silk Agency.

Another European spun silk and schappe manufacturer has arranged with an American representative to put its well known products on the market. It is The Filature Lyonnaise de Schappes, J. Villard & Co., Lyons. Its American representative is Alfred Suter, textile engineer, 487 Broadway, New York, who solicits the attention of manufacturers using spun silk and schappes in the gray, in singles and doubles, on cops and in skeins. He will be pleased to submit samples and quotations to interested parties.

Rice's Gloss Mill White.

The U. S. Gutta Percha Paint Co., Providence, R. I., state that while they have always known that Rice's Gloss Mill White greatly increased the lightness of mill rooms, they have not had until recently the exact data of percentage. The Electrical Testing Laboratories of New York were commissioned to make exhaustive tests, using the photometer for calculating light in a given room. The amount of light was accurately measured before and after applying Gloss-O-Lite, and the result showed a remarkable increase in light, as the result below proves. It should be noted that while Gloss-O-Lite was used in this test by the Company, Rice's Gloss Mill White has the same light-reflecting qualities.

Tests of Daylight Illumination in an Office.

Order No. 4,836.

The ceiling in this office was of a light buff color and having been painted some time ago was somewhat soiled. Upon repainting the ceiling with Gloss-o-lite it was found, as a result of a long series of careful and accurate tests, that the illumination was increased upon the desks about 30 per cent. Tests under varying conditions of weather showed improvements ranging from 19 to 36 per cent.

The technical details of these tests are recorded in report No. 7,404.

Z. N. Corraz,
In Charge of Test.

Approved by
Preston S. Millar,
Asst. to Manager.

Softeners.

The Scholler Bros. Co., Philadelphia, Pa., state that they manufacture one of the finest softeners for cotton goods, especially for knitted fabrics. It is composed of two per cent. of "Kastilene" and one per cent. of "Brosco Oil."

The manufacturers state that "Kastilene" contains the best, high grade softening oils which are beneficial to cotton goods, while "Brosco" oil is a substitute for olive oil at one-third the cost, and if used in equal quantities gives a far superior finish. This mixture is readily soluble in water at all temperatures, is neutral and does not affect colors. It is also claimed that less "Brosco" oil can be used and as good results obtained as with olive oil. Samples can be obtained by application to manufacturers.

Crane Mfg. Co.

C. H. Perkins, formerly vice-president and general manager of the Crane Mfg. Co., Lakeport, N. H., is now president, having been elected to succeed the late John S. Crane, who died in January. Benjamin J. Smith, general foreman, is now vice-president and also retains his former duties. The other officers of the company, Herbert R. Young, treasurer, and Irving S. Elliott, remain the same.

This company is meeting with much success just now with one of its specialties, an improved automatic latch needle toque machine. Although they are widely known in connection with their circular spring needle machines, it should not be forgotten that they build a flat machine adapted for knitting collarettes and other small machines for ribbed tops, cuffs, drawer bottoms, hose legs, as well as for the manufacture of sweater coats, golf jackets and underwear.

Record Electric Installation.

Electric motors are taking the place of steam in many manufacturing plants, but for a quick change The Gandy Belting Co., of Baltimore, Md., manufacturers of the Gandy stitched cotton duck belting, seems to have broken all records.

On March 9th last the 150 h. p. steam plant of the Gandy Co. broke down.

By noon the following day, just 24 hours later, the entire plant was again in operation.

The 150 h. p. is furnished by two motors, one of 100 and one of 50 h. p.

At the time of the breakdown the 100 h. p. motor was in Philadelphia, which will give some idea of the difficulties encountered.

Orders for Picking Machinery.

The Potter & Johnston Co. of Pawtucket, R. I., have received orders from the Central Textile Co. of Memphis, Tenn., the A. S. Shuford Co. of Oklahoma, and the Panola Cotton Mills of Greenwood, S. C., for the picking machinery for their new mills, and also have received orders for additions to the picking plants of the Royal Weaving Co. of Pawtucket, R. I.

Erecting men are now at work at the plant of the Grant Yarn Co. of Fitchburg, Mass., erecting a new outfit of breakers and openers with double hopper feeders, these machines being on separate floors and are connected together by cleaning trunk having their patented sheet iron sliding doors.

Expert Bleaching and Dyeing.

The San-Knit-Ary Bleachery, Inc., Simon Friedberger, president, is making a specialty of bleaching hosiery and underwear. Their large plant at 2622 North Front St., Philadelphia, is adequately fitted with all the improved machinery for this work, which enables them to handle it promptly and in a satisfactory manner.

American Moistening Co. Appoints New Southern Agent.

J. F. Porter of Atlanta, Ga., who has been associated with the American Moistening Company for the last sixteen years in connection with their southern department, has been appointed their Southern Representative, with headquarters at Charlotte, N. C., succeeding Mr. J. S. Cothran, who retires on account of other interests which require his entire attention. Mr. Porter has been long and favorably known throughout the South, and his many friends will be pleased to congratulate him on his new position.

New Starch Agency.

Announcement is hereby made that the Industrial Starch Company has become the sole selling outlet for all the textile starches of the Huron Milling Company.

Attention is called to the change of address to new quarters at 184 Summer St., Boston, Mass., telephone Fort Hill 739.

The business of the Company comprises staple and specialized pure starch products for sizing and finishing to meet a great variety of weaving conditions, and to give all kinds of cloth effects.

The Murphy Automatic Furnace.

The Murphy Iron Works, Detroit, Mich., manufacturers of the Murphy automatic furnace, have received an order from Lockwood, Green & Company for Murphy furnace equipment for six 500 h. p. boilers for the new plant of the Massachusetts Cotton Mills, Lowell, Mass. The New England manufacturers are becoming greatly interested in this service, as is evident by recent orders received. The American Woolen Company, for their new Ayer mill, ordered furnace equipment for eight 600 h. p. boilers, the furnaces being the largest of their kind ever manufactured. The Ludlow Manufacturing Assocates, Ludlow, Ky., have also placed order for Murphy furnace equipment for 1800 h. p. boilers.

We are also informed that Joseph Bancroft & Sons within the last 30 days have placed orders for Murphy furnace equipment for two 250 h. p. boilers for their Reading Cotton Mills, Reading, Pa., and for two 500 h. p. boilers for their Wilmington, Del., plant, this being the sixth repeat order for Murphy furnaces placed by this company since 1903, making a total of 4,500 boiler horse power now equipped.

Diesel Engine Will Furnish Power.

The Fisher Mfg. Co., which is building an extensive addition to their plant at Fisherville, Mass., will install a large Diesel engine to give them the increased power which they will need. The Diesel engine is interesting textile manufacturers very much on account of its remarkable fuel economy.

Talbot Mills to Sell Direct.

Announcement is made by the Talbot Mills, North Billerica, Mass., Frederick S. Clark, president, that on and after May 1 their product will be sold direct by Arthur M. Cox, selling agent, Pocono Bldg., 229 Fourth Ave., New York. Parker Wilder & Co. fill all orders prior to May 1.

Keeping Shop Records of Belting.

The average textile mill buys a large amount of belting each year, which is chopped up and put on various machines throughout its plant as belting gives out. Few plants keep any record of the actual length of service of the belts on any particular machine. At the end of a year's time it is not definitely known whether the belt equipment for the various kinds of machinery in the shop has cost more than it should or not.

We believe that textile mills generally will be interested in a plan of keeping shop records which have just been devised by the enigneers of the New York Leather Belting Company, 51 Beekman St., New York City. Charts have been printed, which can be tacked up on every floor in a factory, and, by merely filling in certain blanks, entailing little or no trouble, at the end of the year the exact record of belts on every machine on that floor can be absolutely checked up.

In this age of cost reduction systems, we believe that a system of "shop belt records" of this sort should be kept. The belt record charts of the sort described above may be had by applying to the above company.

Announcement.

The Boston Belting Co. advises the trade that their arrangements with the Jewell Belting Co. of Chicago to act as their Western agent have been terminated.

They have opened their own store at 177 Lake St., Chicago, with M. S. Curwen, manager of sales, in charge, and will carry in Chicago a more complete assortment of rubber belting, hose, packings and other mechanical rubber goods than in the past.

Change of Address.

The sales offices and demonstrating room occupied by John W. Fries, manufacturers of the Hygrosso humidifiers, have been moved to the third floor of 88-90 Center St., New York.

Among the recent sales of Crocker Wheeler motors in the textile industry are one to Carl Stohn for his new mill in Massachusetts, 100 KVA A. C. engine type generator with direct current exciter, and a large KW engine type D. C. generator sold to the Roxford Knitting Co. of Pennsylvania.

New York, West Sand Lake. The McLaren Knitting Co. is building an addition in which a 200-h. p. kerosene engine will be installed.

Hygrosso Demonstrating Exhibit at Charlotte Convention.

A practical demonstration of the Hygrosso Humidifier will be given during the May meeting of the American Cotton Manufacturers' Association at Charlotte, N. C. Convenient quarters have been secured in the Peidmont Building, Room 111, and visiting manufacturers may have an opportunity to see the Hygrosso Humidifier in operation with the latest improvements and controlling devices.

Champlain Silk Mill's New Office.

The Champlain Silk Mills of Whitehall, N. Y., have opened an office at 318 Main St., Springfield, Mass., in charge of Mr. Karl Hatch. This office was opened especially to further the interests of New England manufacturers using spun silk, giving them the advantage of direct and immediate communication, and facilitating prompt service.

The Wool Tariff in Kansas.

The new law makes no raise of the tariff on woolen goods, but in three items the law lowers the tariff. These three items were woolen dress goods, yarns and taps. The junior editor asked an Atchison woman about the item of "taps." She said it was a woolen material used by tailors, dressmakers and housewives for binding, etc. This puts "taps" in the list of necessities. Otherwise the new law is the same as the Dingley tariff. President Taft and others would like to have some more reductions. But on the other hand the sheep raisers on the American farms and the two hundred thousand working people who sort, wash and scour the wool, who comb and card it, who spin the yarn and weave the cloth in American mills, opposed any change. And there you are.—The Atchison Champion.

Single Bed Rotary Press.

L. H. A. Schwartz & Co. are having quite a number of orders for their improved single bed rotary press. They state that the quality of the work by this press has been superior and that in some instances one-third more production has been obtained than with the old style press.

North Carolina, King's Mountain. The stockholders of the Lula Mfg. Co. have decided to dissolve the corporation, which has capital stock of $150,000 and operates 10,000 spindles on 10s to 26s yarns. It is claimed that during the past two years the business has been conducted at a loss.

North Carolina, Pilot Mountain. At the sale of the Pilot Mountain Cotton Mills, the property was bid in for the bond holders by Edward Howard of Charlotte for $15,000. It is not known as yet whether the plant is to be operated or disposed of.

(Continued from Page 222.)

Papers Read at Convention of National Association of Cotton Manufacturers.

Some Recent Advances in the Chemistry of Coal Tar Colors.

HUGO SCHWEITZER, Ph.D., 117 Hudson St., New York City.

In view of the far-reaching possibilities of synthetic chemistry and the fortunate cooperation of science and technique in the industry of coal-tar colors, an enormous progress is yearly registered. In the time allotted me I can therefore take up only some of the most important advances which have been recently made, and I shall especially restrict myself to reviewing those new dyestuffs which possess extreme fastness, surpassing in that respect everything which either nature or chemistry has hitherto produced. As you know, the impression prevails among the public that the shades obtained with "aniline colors" are extremely fugitive and that they cannot withstand the influence of time, light and chemicals to the same extent as the colors furnished by nature. This belief is due to the fact that among the first discovered aniline colors there were quite a few which reproduced the splendor and beauty of the hues of the butterfly, but, unfortunately, shared with it its short existence.

In order to show how relative the idea of "fastness" is, and what conditions and characteristics must nowadays be considered before a manufacturer finally decides to place a dyestuff on the market, it may be of interest to mention the points which must be ascertained before a newly invented color can become a commercial product. Formerly, when a dyestuff had a desirable shade, was fast against acid and alkali, and perhaps reasonably so toward light, the manufacturer invariably proceeded to place it on the market.

Today it is an exceedingly intricate matter to decide whether or not to market a certain color. Above all, of course, the price is to be taken into consideration; next to this, the question whether the color can or should be protected by patents, or whether it infringes upon the patent rights of a competitor. The shade naturally plays an important part, and then follow solubility, level dyeing, power of penetration, tinctorial power, exhaustion of the dye-bath, properties by which the method of dyeing is determined. After these come tests for fastness to acids and alkalies, to carbonization, fastness to various forms of washing, such as boiling, scouring, crabbing, fulling and potting; fastness to light, and the appearance of the shade in artificial light; fastness to ironing; then fastness to perspiration and street dirt; fastness to rubbing; cross-dyeing and to washing and boiling along side of white; fastness to sulfurous acid (stoving), to chlorine and to the after-treatment with chrome. It must be determined how the color discharges and whether it can be used for color discharging.

After these properties have been ascertained and found satisfactory, it must be determined for what purposes the dye might be profitably offered. It must further be decided for what dyeing process and for what material the color is to be recommended. As far as the dyeing process is concerned, machine dyeing and the ordinary wet dyeing must be considered.

If the dyestuff is a wool color, it must be determined whether it is fit for dyeing loose wool, slubbing, cops, tops, knitting yarns, worsted yarns, carpet yarns, shoddy and piece goods.

If it is a cotton color, it must be demonstrated whether it is fit for dyeing raw cotton, yarn, cops, or tops, shirtings, awnings, upholstery, madras, ginghams.

When the color is adapted for silk, it makes some difference whether the material is weighted or unweighted, but otherwise the application is simpler, as most of the silk is dyed in skeins and only very little in pieces.

Finally, the question comes up as to the suitability of the dyestuff for union goods, and this constitutes perhaps the most valuable property of some dyes. Union goods are mostly dyed in the piece, only very little twisted yarn being used in hosiery.

Then the colors must be examined as to their usefulness in printing textiles, which again means a large variety of tests.

A matter of fact, the testing of the dyeing properties of aniline colors has been formerly so much neglected that nowadays when new requirements are demanded it is advisable to examine even the very oldest colors as to their suitability for certain purposes. In this way very important observations have been made, and some of the dyestuffs discovered at the beginning of the industry, but for which little use was found at that time, have been reintroduced with great success under a new name and for a new purpose.

It is self-evident that products which can stand such severe tests must possess thoroughly satisfactory properties, and although the modern dyer and printer have become extreme in their demands as to fastness and beauty of shades, the color manufacturer as a rule has been able to fill their exacting requirements. In fact, in many cases he has exceeded the demands of the consumers and offered them products distinguished by qualities which had been considered well-nigh incredible only a short while before, and surpassing, of course, in every respect the colors produced by nature.

The most wonderful advances in the production of new colors of extreme fastness are to be found in the class of alizarin colors. Since the first production of synthetic alizarin in 1869 up to about 1888 the progress in the alizarin colors was very slow, and only a few representatives had been placed on the market. A very rapid change took place when the hydrolization of the then known alizarin colors by means of concentrated sulphuric acid was first observed by Rene Bohn, and such colors as the anthracen blues, alizarin green, alizarin indigo blues and the series of alizarin cyanines and their derivatives were added to the alizarin group. These were soon followed by the discovery of Robert Schmidt of the beautiful acid

dyeing alizarin colors, such as the alizarin saphirols, the alizarin irisols, the alizarin viridines, the alizarin astrols, the emeraldols.

The most interesting stage in the development of the alizarin series was reached when Rene Bohn discovered the class of vat dyeing alizarin colors called after its original member the indanthrene colors. The first indanthrene was made from betaamidoalizarin. Not only that the substances discovered by these reactions are important and valuable dyestuffs, but they are also of the greatest scientific interest.

The most curious ringformations were observed and the establishment of the constitution of these complicated bodies required the greatest ingenuity and such research as the Scholl synthesis of Flavanthrene belongs to the classical work accomplished in chemistry.

Betaamidoalizarin was the reduction product of one of the oldest alizarin colors known, namely, alizarin orange, which chemically is nitroalizarin. When betaamidoanthraquinone is subjected to the identical reaction which produced from anthraquinone sulphonic acid the first synthetic alizarin —that is, melting of the product with caustic alkali at high temperature—a dihydroanthraquinoneazine is obtained.

By alkaline reduction this substance, under disappearance of the blue color, furnishes a brownish solution containing the tetrahydroanthraquinoneazine. This change is due to the transformation of the four CO groups into CO H groups and this conversion renders possible the employment of these substances as vat colors.

As late as August, 1908, the inventor stated in a lecture that simpler derivatives of anthraquinone also furnish vats by such reduction, but these vats have no affinity for the fiber, and it seemed to him that at least two anthraquinone nuclei must be condensed with each other and must have in each nucleus at least one keto group in order to furnish suitable vat colors. This rule, however, has not been definitely established, for later research has shown that very simple anthraquinone derivatives are excellent vat dyestuffs.

In the same lecture Bohn divided the indanthrene colors into five distinct groups:

I. Indanthrene colors, embracing the colors of the indanthrene type, its halogen-, amido-, and oxy- derivatives, flavanthrene, pyranthrene, auranthrene and their derivatives.

II. Benzanthrone colors, embracing the violanthrenes, indanthrene violet, nitroviolanthrene and isoviolanthrene.

III. Cyclanthrene colors, embracing indanthrene bordeaux, indanthrene red.

IV. Algol colors, embracing algol red, etc.

V. Colors of still unknown constitution, such as melanthrene, fuscanthren, indanthrene brown, olivanthrene, indanthrene orange, indanthrene copper.

VI. To these five classes we may add as a sixth group the simple anthraquinone derivatives with only one anthracene nucleus.

While the original indanthrene is a most remarkably stable color in many respects, it lacks fastness to chlorin. By converting the indanthrene substance into di- and tri-brominated and dichlorinated derivatives, this disadvantage was remedied. Indanthrene C is a mixture of the di- and tri-brominated derivatives, and indanthrene CD is a dichlorinated derivative of indanthrene. Without subsequent chlorination or bromination, it is possible to prepare directly from brominated amido anthraquinones a brominated indanthrene. The indanthrene reaction has also been extended to the condensation of alizarin itself with diamidoanthraquinone and further to the substitution of alizarin by purpurin, alizarin bordeaux, alizarin blue. In this way a very large variety of colors has been obtained.

If the treatment of betaamidoanthraquinone with caustic alkalies is carried out at 330° to 350° C. instead of at 200° to 300° C., at which temperature indanthrene is formed, a yellow substance is obtained, which is characterized by furnishing a deep blue vat, and dyeing cotton a very fast yellow. This substance is called flavanthrene and is one of the most interesting members of this family.

With this extremely stable color an interesting observation was made which at first thought threw doubt upon its fastness. The material of an air baloon was dyed with flavanthrene. In the intense rays of the sun at some thousand meters height the yellow material turned green. It was found that this change was not caused by the influence of light, but was rather due to the reduction of the flavanthrene by the cotton fiber under these extraordinary conditions; for after landing and keeping the material in the dark, it resumed the original color by the action of the atmospheric oxygen. Under ordinary circumstances the reduction of flavanthrene by the cotton fiber is seemingly counterbalanced by the oxidation of the atmosphere, and the stability of flavanthrene on the fiber must obviously grow with age because the oxidation remains always the same, while the reduction by the fiber becomes gradually weaker.

The ingenious synthesis of Scholl led to the production of pyranthrene from the intermediate dimethyldianthraquinonyl, which by heating is converted into a substance furnishing a bright red vat and dyeing cotton red, which changes on washing into a yellow orange of extreme fastness.

The pyranthrenes are the first examples of reddish yellow vat dyes which contain no nitrogen in their molecule.

The auranthrenes are derivatives of anthraflavon. They stand in very close relation to the pyranthrenes, as they are also free from nitrogen.

Anthraflavon is produced from betamethylanthraquinone by condensation with itself. It furnishes a brownish red vat which dyes cotton brown-red, turning pure yellow on washing.

If we now take up the second group, we find here, as the mother substance, benzanthrone which is produced by condensation of anthraquinon with glycerin.

The discovery of this substance was brought about by subjecting betaamidoanthraquinone to the Skraup synthesis, in the hope of producing a quinoline analogous to alizarin blue, which is formed from betaamidoalizarin in the same reaction. It was found, however, that the reaction did not stop at the quinolin formation, but that an-

other molecule of glycerin was included in the condensation, thus forming a substance named benzanthronequinolin. An explanation for this peculiar behavior was afforded by the fact that the hydroxyl groups of alizarin prevented the entrance of a second glycerin molecule into the newly formed substance. When afterwards anthraquinone itself was condensed with glycerin directly, the above benzanthrone was obtained.

The violanthrenes dye intensely blue violet, give very fast shades, and are the first example of blue colors, dyeing the vegetable fiber without any mordant, which do not contain any nitrogen in their molecule.

From benzanthraquinoline by melting with caustic alkalies the cyanthrenes are obtained, the constitution of which is not yet fully established.

It can be easily seen that a large variety of vat colors can be produced from these mother substances and their condensation products by halogenization, etc.

They are produced from two molecules of 2. chloranthraquinone and one molecule of 1.5 diaminoanthraquinone. They were the first representatives of bodies in which three anthracene nuclei were combined with each other by means of nitrogen.

Although in the cyclanthrenes the anthracene nuclei are not attached to one another by closed rings, these substances dye cotton extremely fast bordeaux red shades from a yellowish red vat.

The algol colors belong to the fastest dyestuffs known at the present day.

To the group of colors of unknown constitution belongs melanthrene obtained from various diaminoanthraquinones (1.5, 1.8, 1.3, 2.6, 2.7) by melting with caustic alkalies. They dye cotton bluish grew to reddish grey.

The fuscanthrenes are produced when the formaldehyde compounds of diaminoanthraquinones (1.5, 1.8) are heated with caustic alkalies. They dye reddish brown.

While the above substances have at least two anthracene nuclei in their molecule the very latest patents show that vat colors have also been obtained from such simple anthraquinone derivatives as the benzoyldiaminoanthraquinones, oxy benzoylaminoanthraquinones, etc.

This simplicity of constitution opens up a vast field for new varieties of this important class of colors.

There is no doubt that the excellent results obtained with the anthraquinone vat colors in the dyeing of cotton of all possible shades will bring about a complete revolution in this art.

The method of dyeing in a vat is comparatively easy and cheap and the day is not far distant when the mordant-dyeing cotton colors, the direct substantive cotton colors, and the sulphur colors will be driven out of the market.

While these colors are of such great importance for the dyeing of cotton they possess hardly any affinity for wool. Such anthraquinone colors are, therefore, not "true vat colors," a designation which is reserved for indigo, its derivatives and analogous substances, which possess affinity alike for the vegetable and animal fiber.

In the chemistry of these colors results have recently been obtained which, if anything, are more important than those described above.

The grand accomplishment of the economical synthesis of indigo has made it possible that a number of derivatives, such as the chlorinated and brominated indigoes, can now be cheaply manufactured. Of especial importance among them are the brom-indigoes, known in the market as M L B/R/2B/4D/6B, brom-indigo F B, indigo R B, RB N, ciba blue B N, 2B, these being blue vat dyes possessing, however, much greater fastness to chlorine than indigo itself. These derivatives are for the most part obtained by direct chlorination or bromination of indigo. The synthesis of indigo also permits the direct preparation of indigo substitution products by the final condensation of substituted phenylglycin ortho carbonic acids, and in this manner various derivatives of indigo have been obtained.

The latter tetrabrom derivative is the most valuable halogen derivative of this series and is produced by brominating indigo in boiling nitrobenzol solution by means of eight atoms of bromin.

But the most remarkable development in this group of colors was accomplished when Friedlander in his efforts to produce the purple of the ancients, succeeded in discovering new reactions which permit the preparation of an endless variety of most valuable new vat dyes.

The observation which gave Prof. Friedlander the clew to his further experiments was his discovery that cumaranon was a substance which greatly resembled indoxyl in its atomic grouping and in its chemical behavior.

Both substances are converted into colors by oxidation, in which reaction cumaranon furnishes a nitrogen free substance analogous to indigo which dyes a red shade, but is very fugitive.

Mixed asymmetric colors, embracing thio indigo scarlet R, its dibromin substitution derivative, thio indigo scarlet G, ciba red G, thio indigo scarlet 2 R, ciba scarlet 2 G.

They are obtained by condensation of oxythionapthene and its derivatives with isatin and such substitution products bearing the substituting groups in the benzole nucleus. Thio indigo scarlet is an anologous of indirubin obtained from isatin and indoxyl.

A tremendous activity in this field is constantly observed, and more than three hundred German patents were issued in 1907 and 1908 for thio indigo and analogous substances.

In this connection it may be of interest to state that Friedlander, after years of research, at last succeeded in establishing the identity of the purple of the ancients. He isolated the active dyeing principle of the purple shell fish of the Mediterranean, murex brandaris and murex trunculus, which is contained in a small gland, already described by Aristotle and termed "vena" by Pliny. The method of procedure was as follows:

The contents of the gland, not more than a drop, was placed on filter paper and by exposure to the sun the coloring matter was developed. He then mercerized the filter paper and by extracting the mass with hot dilute sulfuric acid removed the more easily soluble impurities. Finally, he extracted the dyestuff by means of solvents with a

high boiling point such as quinolin or benzoic acid ester and by recrystallization from these solvents obtained it in pure form. He found that the substance contained a large amount of bromin and determined that it was a dibrom indigo, identical with the 6.6 dibrom indigo, which had already been produced before synthetically.

From the 12,000 shell fish used for his experiments he obtained only 1.5 gm. of the color, which explains why this substance was so precious and expensive in olden times. As the price of purple wool during the reign of Diocletian was about $240.00 a pound, it is calculated that one kilo of purple in the year 301 must have cost about $10,000.00 to $12,000.00. On account of the dull red-violet color of the natural dyestuff it would be hard to even give it away today, and the corresponding synthetic dibrom indigo has never been placed on the market owing to its valueless properties.

It seemed that with the introduction of the indanthrenes, algols, thioindigos, what seemed well-nigh impossible has been accomplished. Yet there are constant new demands; style prescribes the weaving together of various fibers which must be dyed either of like or different shades, dyeing machines are being invented which establish new conditions as to the reaction and consistency of the dye bath, and thus an active competition is maintained which resembles the rivalry between the manufacturer of armor plates and projectiles.

Some of these modern colors have even invaded the hallowed ground of the artist's palette. With but one exception, namely, the red alizarine lake, painters use exclusively inorganic colors in their oil paints. Now after almost four years of experimentation in conjunction with the most famous of American landscape painters, Birge Harrison, we succeeded in adding a yellow and a red to the palette, of which the yellow is five and the red two and one-half times as fast and stable as the best colors hitherto employed for this purpose. As you can readily imagine there is no profit in the sale of the few pounds of dyestuff that would be sufficient to supply the painters of the world with these colors. The experiments were carried out solely for the benefit of art in full recognition of the tremendous responsibility of suggesting changes which might prove disastrous to the artist's creations. They are being continued, so that, in the end, synthetic organic colors will reign supreme in this field as they do in all others.

In conclusion, it may be of interest to review what colors of animal and vegetable origin were at the dispósal of the dyer prior to the introduction of the aniline colors, and by presenting such a list it will be easy to demonstrate the utter inadequacy of the natural products for modern requirements. As red colors there were used madder, Brazil wood, orchil, cochineal and lacdye. Artificial alizarin is incontestably superior to madder in every respect and many red azo dyestuffs possess dyeing properties which make them of infinitely more value in the textile trade than the natural products, of which Brazil wood is characterized by proverbial fugitiveness.

For yellow shades the dyer of olden times had at his disposal fustic, quercitron and persian berries. There are now many direct cotton dyeing coloring matters and many wool dyes which by the after treatment with chrome become perfect substitutes for these yellow dyestuffs in every particular.

The most important natural blue was indigo, which has now become an artificial color, and to such an extent that for the last few years importation of natural indigo to the United States has pracically been abandoned.

Logwood was mostly used for blacks. It has been largely superseded today by artificial colors, which possess many more valuable properties for every application, so that logwood is employed only where it appears advantageous on account of low price. Natural browns, such as catechin, are surpassed by the brown sulphur colors, and Saunders wood is in every respect inferior to alizarin brown.

We thus see arrayed against these few natural products a host of superior artificial colors with which every demand of the modern dyer can be satisfied, demands which grow more exorbitant from year to year and which could not possibly be filled by the colors supplied by nature. The much vaunted achievements of the good old times are of necessity a myth as far as fastness of dyes and superiority of textiles are concerned, and the purple and fine linen of the ancients would look decidedly queer in a modern department store. The fabrics which the daughters of the Pharaohs used for their personal adornment would not find favor in the eyes of the poorest woman of the present day, even if sold at bargain counter rates, reduced to 98 cents from $1.00.

[In connection with this paper there were presented chemical charts and diagrams, which would be of interest to an expert dyer and chemist and which may be procured from us in full by those interested.]

Choice of Power for Textile Mills.

CHARLES T. MAIN, 201 Devonshire St., Boston, Mass.

Most of the earlier mills were located upon a river, in order to take advantage of water power. Many of the manufacturing centers were started in this way, and the sites of many of the isolated mills were chosen for this reason. Most of the water powers within reasonable distance in New England which have been so used, have been outgrown, and in some of these places there is a preponderance of steam power over water power. New centers of manufacturing have grown up, some on tide water where cheap fuel and low rates for transportation can be obtained, and some of the most prosperous mills are driven by steam power.

Recently the transmission of electrical power and the use of electrical power in the mills has caused water powers which were remote and of no value, to become useful and valuable, and has enabled the construction of central power stations at the mouth of mines or on tide water where cheap fuel can be obtained. These recent developments have made it possible to locate the mills more advantageously with reference to labor centers and

with reference to the physical structures, light and railroad facilities.

The chief items of the cost of textile manufacturing are materials and labor. The cost of power is rarely over 5 per cent. of the total cost of the product of the mill, and while the cost of power is an item which should receive careful consideration, it is of more importance to locate in some place where a sufficient number of operatives skilled in the particular kind of business to be carried on can be produced and where reasonable freight rates can be made, than to locate where power is cheap and the other items lacking. A saving of 10 per cent. in the cost of power will represent a saving of not over one-half of 1 per cent. in the total cost of the product. The relative importance of locating where power is cheap, increases as the ratio of the cost of power to the value or cost of the product, increases.

Some of the earlier mills which have been located on a variable stream, primarily for the sake of using water power, which power to a large extent requires supplementary steam power, are probably handicapped to a certain extent, on account of their location, the restricted methods of construction and by the necessity of maintaining and running a double power plant.

At the present time many of these restrictions have been removed on account of the possible use of electric power produced by the company itself, or which can be purchased from some power company producing power by water or steam, or a combination of both.

In many instances the promoter of a new enterprise can have his choice of producing his own power by water or steam and transmitting it mechanically or electrically, but the choice in New England of using any water from development of his own is rapidly diminishing, unless he is already the owner of such, but in other parts of the country these possibilities still exist.

The possibilities of purchasing electric power are on the increase, as the number of central stations, either steam or water power, is on the increase. In the older plants there is nearly always the possibility of reorganization of the power with one or more central stations owned and run by the mill itself.

STEAM POWER.

Nearly all values and costs of power are at the present time compared with the cost of producing power by steam.

An industry which is not yet established, can, by using steam power, locate at any place where it seems desirable, but if possible, the location should so be made as to warrant a supply of water for boilers and condensers and for manufacturing purposes, if any is required. We will, therefore, assume that the cost of steam power is the basis to work from for all computations and deductions to follow.

As electric driving is becoming so common in textile mills, we will assume that this is to be used. In making up the cost of steam power, all charges have been considered, except interest and taxes on the cost of land. The fixed charges, including depreciation, repairs, insurance and taxes, have been assumed at 11 per cent, and the running time of 50 weeks of 58 hours each, or 2,900 hours a year. The cost of coal is assumed at $5.00, and $4.00 per long ton delivered in the coal pocket. It is assumed that there will be two steam turbine units in each plant.

Steam power costs the least where the load is comparatively steady, as in textile mills, and the net cost is reduced where there is use for exhaust steam or warm water. These latter conditions are found in colored mills.

The principal items affecting the cost of steam power are as follows:

1. Cost of fuel delivered to boilers.
2. Amount of power produced.
3. Fixed charges on cost of plant.
4. Attendance and supplies.
5. The net cost is reduced in some concerns where the waste heat of the power plant can be used in the manufacturing processes in the form of low pressure steam or warm water.

COST OF STEAM POWER USING STEAM TURBINES.

In most textile mills, the power plant will vary from 1,000 to 5,000 kilowatts capacity. There will be some instances where the power used is less than 1,000 kilowatts, and some in which the power required will be more than 5,000 kilowatts, but for the purposes of this paper, we have considered this range as sufficient for illustration.

With a modern plant, the following figures for cost of installation are fair, when no steam is used for anything but power.

Size of Plant in Kilowatt	1,000	2,000	3,000	4,000	5,000
Cost of plant per kilowatt	$125 00	$110 00	$100.00	$95 00	$90 00
Total coal per kilowatt hour in pounds	3.0	2.8	2.7	2.6	2.5
Yearly cost per kilowatt coal at $5	$39 00	$34 00	$31 50	$30 25	$29 50
Cost per kilowatt hour coal at $5, in cts.	1.34	1.17	1.09	1.04	1.02
Yearly cost per kilowatt coal at $4	$35 00	$30 50	$28 00	$27 00	$26 25
Cost per kilowatt hour coal at $4, in cts.	1.21	1.05	0.97	0.93	0.91

The cost per engine horse power for installation and operation is three-quarters of the figures given per kilowatt.

To compare with equivalent cost per indicated horse power, take 65 per cent. of the above figures given per kilowatt.

EFFECT OF USE OF WASTE PRODUCTS.

It has been common practice for many years to use exhaust steam of non-condensing engines and steam from the receivers of compound engines for manufacturing purposes for heating buildings.

The saving by the use of exhaust steam, which would otherwise go to waste, is considerable. In some mills, especially colored mills, if the power is not produced by steam, so that the low pressure

steam can be used for manufacturing purposes, it would be necessary to maintain a boiler plant of sufficient size to produce an equivalent amount of exhaust or receiver steam thus used.

From the information we have at present, it seems that the impulse turbine will give about the same efficiency when bleeding steam from the lower stages as the steam engine. The reaction type does not seem to show to such good advantage in this respect in the present regular designs. If properly modified for the special purpose, it can probably be greatly improved for the purpose of bleeding.

In the lack of more accurate data on bleeding turbines, we will assume that the savings by doing it are the same as for the steam engine.

The reduction effected by the use of low pressure steam upon the net cost is shown approximately in the following table:

Per Cent. of Steam Used	COAL AT $5.00		COAL AT $4.00	
	Per Kilowatt Year.	Per Kilowatt Hour.	Per Kilowatt Year.	Per Kilowatt Hour.
25	$3 00 to $4 00	0.10 to 0.14 cents	$2 40 to $3 20	0.08 to 0.11 cents
50	6 00 to 8 00	0.21 to 0.28 "	4 80 to 6 40	0.17 to 0.27 "
75	9 50 to 12 00	0.33 to 0.42 "	7 60 to 9 60	0.26 to 0.33 "
100	12 50 to 16 00	0.43 to 0.55 "	10 00 to 12 80	0.34 to 0.44 "

If a portion or all of the condensing water is used for manufacturing purposes, there will be a substantial reduction in the net cost of power, although not as great as by the use of steam.

WATER POWER.

The cost and, consequently, value of water power. depends upon a great variety of factors, but the essential fact is, whether considering the combined result of all these factors, power can be produced and delivered as cheaply in this manner as by any other method.

The chief items affecting the cost and value of water power are as follows:

1. The quantity of water and the uniformity of flow during the year or a succession of years.

A power whose flow is constant is the most valuable.

If the flow is variable, it must be supplemented by steam or other power, and the value diminishes as the need of supplementary power increases. The variability may be so excessive as to make the cost of maintaining and running a double plant more expensive than it would be to produce the same amount of power by steam power alone.

2. The head. The power which can be derived for a definite quantity of water increases directly in proportion to the head, and the cost of development increases per horse power as the head diminishes.

3. The location of the power had a large effect upon the value, but as before stated, the ability to transmit power electrically has rendered useful and of value many powers which otherwise would be valueless. It is now possible, in many cases, to so locate a mill as to get the other desirable features and to run it electrically by water power, but even in such a case, the location of the water power has a large effect upon its value, for the cost of transmission lines will be greater for larger distances to be run and the line losses greater.

4. In nearly all lines of textile manufacturing there are some uses for low pressure steam. The plain mill requires steam for heating and slashing, and the colored mill for heating, dyeing and finishing. The use of exhaust steam and overflow water from the condenser for these purposes tends to reduce the net cost of steam power and therefore to reduce the value of water power for this particular use.

The chief items in the yearly cost of power are:

1. Fixed charges as interest, depreciation, insurance and taxes on the development.

2. The cost of supplementary power, if any is necessary to make up for the fluctuation in water power.

3. Attendance and supplies.

COST OF HYDRO-ELECTRIC POWER.

No definite sum can be fixed as the cost of water power, as this depends largely upon the conditions which affect the cost of the development. Each case must be considered on its own merits. As the chief cost of water power is usually the fixed charges on the cost of the development, the first cost is the most important item for consideration.

In a development substantially made, the fixed charges for interest, depreciation, repairs, insurance and taxes, may be as low as 8 per cent. with a short transmission line to 10 per cent. with a long line. For the purposes of this paper, they are assumed at 9 per cent.

Seventy-five dollars a horse power or $100.00 a kilowatt would be considered a low cost of a development. The cost in most instances would be greater than this, and some developments have been made in which the cost has been so great that it is impossible to make it a paying investment until the capital charges were scaled down.

A uniform power development at reasonable cost is a valuable asset which bids fair to increase in value as time goes on. A uniform power at high cost may not be profitable. A varying power at high cost is pretty sure not to be profitable.

The following table shows in a general way the cost of power under varying conditions of cost.

The above costs are for current on the switchboard in the generating station. The effect of transmission losses is to increase the cost of power delivered to the mill in proportion to the percentage of loss on the transmission lines. These losses for short lines would be roughly 5 per cent. and for long lines 10 per cent.

Adding 10 per cent. to the last set of figures in the preceding table, we have the cost at the end of the line, assuming the cost of plant and line at $300.00 a kilowatt.

COST OF UNIFORM HYDRO-ELECTRIC POWER.

Size of Plant in Kilowatt.	1,000	2,000	3,000	4,000	5,000
Assumed cost per kilowatt	$100 00	$100 00	$100 00	$100 00	$100 00
Yearly cost per kilowatt	12 00	11 00	10 75	10 50	10 25
Cost per kilowatt hour in cents	0.41	0.38	0.37	0.36	0.35
Assumed cost per kilowatt	$200 00	$200 00	$200 00	$200 00	$200 00
Yearly cost per kilowatt	21 00	20 00	19 75	19 50	19 25
Cost per kilowatt hour in cents	0.73	0.69	0.68	0.67	0.66
Assumed cost per kilowatt	$300 00	$300 00	$300 00	$300 00	$300 00
Yearly cost per kilowatt	30 00	29 00	$28 75	28 50	28 25
Cost per kilowatt hour in cents	1.05	1.01	1.00	0.99	0.98

EFFECT OF VARIABLE POWER.

That portion of the power which is uniform and which can be depended upon all of the time is called "permanent power" or "primary power," and that power which is variable and cannot be furnished all the time is called "surplus or secondary power."

Usually there is some permanent useful power in all developments, but all power developed above the permanent must be supplemented as stated above, if it is desired to produce continuous power, and there are very few industries which can succeed unless they can be run continuously.

Size of Plant in Kilowatt	1,000	2,000	3,000	4,000	5,000
Yearly cost per kilowatt	$33 00	$31 90	$31 62	$30 80	$30 00
Cost per kilowatt hour in cents	1.16	1.11	1.10	1.09	1.08

The fixed charges on the supplementary plant would go on whether this plant was used or not at 11 per cent., or $11.00 per kilowatt year. To this must be added the cost of operating, which, under a varying load, would be less economical than regular steam power, and would cost about $2.50 per kilowatt a month, with coal at $5.00 a ton, or about $2.00 a month, with coal at $4.00 for such time as it is run.

These fixed charges would increase the cost of power per kilowatt hour for the year, by about $11.00 divided by 2,900 equals 0.38 cents and the operating charge would increase the cost per kilowatt hour by at least $2.50 divided by 2,900 equals 0.09 cents for each month that the plant is run full.

The total cost of power in such cases would be approximately as is shown in the following table:

COST OF VARIABLE POWER AT SWITCHBOARD OF GENERATING STATION, WITH HYDRO-ELECTRIC PLANT COSTING $100.00 A KILOWATT AND COAL AT $3.00 A TON.

Size of Plant in Kilowatt	Cost of Hydro-el Power Kilowatt Year	Fixed Charges Steam Plant	TOTAL COST WHEN STEAM PLANT IS RUN FOR DIFFERENT NUMBER OF MONTHS.				
			One Month	Two Months	Three Months	Four Months	Five Months
1,000	$12 00	$11 00	$25.50	$28.00	$30.50	$33.00	$35.50
2,000	11 00	11 00	24.50	27.00	29.50	32.00	34.50
3,000	10 75	11 00	24.25	26.75	29.25	31.75	34.25
4,000	10 50	11 00	24.00	26.50	29.00	31.50	34.00
5,000	10 25	11 00	23.75	26.25	28.75	31.25	33.75

Every $100.00 increase in the cost of the hydro-electric development adds $9.00 a year in fixed charges to the cost of power per kilowatt. With coal at $4.00 a ton, instead of $5.00, the cost of supplementary power is 50 cents less than for $5.00 for each month which the supplementary plant is run. Thus a 1,000 kilowatt plant costing $300.00 a kilowatt costs $30.00 a kilowatt for steady power. If supplemented by steam to its full capacity for five months, with coal at $5.00, the total cost of power would be $53.50, and $51.00, with coal at $4.00.

COMPARISON OF COST OF HYDRO-ELECTRIC AND STEAM ELECTRIC POWER.

Comparing the figures made, we can make some general deductions which are of interest.

1. With transmission losses at 10 per cent., a hydro-electric development producing uniform power should cost not over $300.00 a kilowatt, including the cost of transmission lines and all other charges in order to compete with a steam driven station located at the mill with coal at $5.00 a ton, except for the smaller plants outlined above.

With coal at $4.00, the hydro-electro development should cost not over $250.00, except as noted above.

The above is on the assumption that the steam plant produces power only with no allowances for any further use of the by-product.

2. With a hydro-electric development with a variable power, whose variation is so great as to require a supplementary plant of equal capacity to the hydraulic plant, and with coal at $5.00 a ton, the cost of the hydro-electric plant should not exceed the amounts shown in the following table.

Size of Development Kilowatt.	COAL AT $5 00 A TON. Number of Months Supplementary Plant Runs. 1	5	COAL AT $4.00 A TON. Number of Months Supplementary Plant Runs. 1	5
1,000	$250 00	$150 00	$200 00	$100 00
2,000	200 00	100 00	175 00	50 00
3,000	175 00	75 00	150 00	25 00
4,000	150 00	50 00	125 00	25 00
5,000	150 00	50 00	125 00	25 00

For months between one and five, the cost would be proportionate.

3. The above figures would apply approximately to that portion of a power which is above the primary or steady power, known generally as "secondary" power, and which can be supplied for only a portion of the year.

Having determined how much can be put into the development of the uniform power, it can be determined how much further the development could be carried to produce secondary power.

All of the above is for power with no uses for exhaust steam and warm water.

4. The effect of the use of exhaust steam has been shown before as making a considerable reduction in the net cost of steam power.

With coal at $5.00 a ton, each 25 per cent. of exhaust used reduces the net cost per kilowatt a year about $3.50, and per kilowatt hour about 0.12 cents, and with $4.00 coal each 25 per cent. of exhaust used reduces net cost per kilowatt year about $3.00 and per kilowatt hour about 0.10 cents.

The effect of this on a hydro-electric plant is to reduce the amount which can profitably be invested in the development by about $40.00 a kilowatt for each 25 per cent. of steam thus used, with coal at $5.00 a ton, and by about $30.00 a kilowatt where coal is $4.00 a ton, so that if 100 per cent. of the exhaust could be used the maximum economical sum to put in the hydro-electric development of 1,000 kilowatt capacity of constant power, with $5.00 coal, would be about $150.00, instead of $300.00, and with $4.00 coal, $125.00 instead of $250.00.

5. With a variable water power requiring a double plant of water and steam, the conditions might easily be such that it would not pay to consider the water power, as the cost of maintenance and operation of the double plant might exceed the cost of steam power alone.

PURCHASED POWER.

Many mills now have the opportunity of purchasing power from some central power station or power company which is producing power either by steam or water power.

There are many points of advantage to the mill if such power can be purchased at a reasonable price, some of which are as follows:

In a new enterprise, in which the power plant is not already installed, there will be required a smaller investment, or the same investment can be used in machinery for manufacturing the product of the mill.

Less space will be required on account of the omission of the power plant and it may be possible to get a better arrangement of the buildings on that account.

Some care of the power plant may be removed from the manager.

The company is able to postpone the introduction of a power plant to some later date and is thus able to take advantage, if they desire later, of any improvements in power plant equipment which may be brought about during the period when current is purchased.

Assuming that the mill will consider the purchase of power on a basis of cost of production by its own plant, how much can it afford to pay for some?

1. In a plain mill making no use of exhaust steam for guaranteed power, it can afford to pay about $30.00 a kilowatt year, or one cent per kilowatt hour for 5,000 kilowatts to $40.00 per kilowatts a year, or one and one-third cents per kilowatt hour for 1,000 kilowatts with coal at $5.00 a ton, and about 0.9 to 1.25 cents per kilowatt hour with coal at $4.00.

2. In a colored mill, using all of the waste products, it could afford to pay about 0.4 to 0.5 cents less per kilowatt hour with $5.00 coal, or 0.3 to 0.4 cents less with $4.00 coal, than for a plain mill.

3. With an established mill with a good power plant all built the mill has its investment in steam plant to charge off and it could afford to pay an amount somewhat less than if it were a new mill and could save the investment in steam plant. The cost of such a plant with no electrical apparatus would be about $50.00 to $60.00 in mills of fair size. The fixed charges on this at 11 per cent. would be about $6.00 a year, or dividing by 2,900 hours, 0.2 cents per horse power hour, or 0.27 cents per kilowatt hour. This amount should be deducted from the preceding figures. If the mill is already equipped with generators, the cost of plant will be more and the amount to be deducted, more.

If, however, the steam power plant is not efficient, no such deduction as shown above should be made.

4. For amounts of power less than 1,000 kilowatts, the price which could be paid would increase and amount to very much more if in 100 kilowatts blocks.

5. All of the figures presented have been made for textile mills, the load of which is fairly uniform and the service less severe than for almost any other business. Some other kinds of business can pay considerably more for power than textile mills.

6. For secondary power which could be furnished for a portion of the year only, the principal

saving would be coal. There would be no saving in investment and very little, if any, in attendance and supplies.

In a modern plant the coal for all purposes of power should be not over three pounds per kilowatt hour for a station of 1,000 kilowatts capacity and less for larger ones. This, at $5.00 per ton, equals about 0.7 cents per kilowatt hour and with coal at $4.00 per ton, about 0.54 cents per kilowatt hour.

A fair price for this kind of power would vary from 0.5 to 0.7 cents per kilowatt hour, or from $15.00 to $22.00 a kilowatt a year.

CONCLUSION.

The object of this paper is to assist the officials of mills in a general way in deciding upon the motive power which would be best to use under their particular conditions. Each mill is liable to have some peculiar conditions and each case may require careful consideration. There may be conditions which would warrant a greater expenditure for water power or purchased current than has been indicated, but in order to have some basis of comparison everything has been compared with the cost of power produced by a modern steam plant run with reasonable skill.

All figures have also been made on the assumption that the mill is electrically driven. The advantages of this method are many and do not need to be repeated here.

The disadvantages are the greater cost of installation and usually a greater cost of operation, and for small mills which do not expect to extend it is probably better to have mechanical transmission. This will tend to reduce the amount which the mill could pay for outside power.

All of the estimates and discussions are limited to power for textile mills. For other industries and for other uses, with different load factors and hours of running, the cost of production and method of application will vary so much that the figures presented may not be applicable.

Progress of the Diesel Engine.

E. D. MEIER, 11 Broadway, New York City.

It is hardly necessary in an assemblage of cotton manufacturers to emphasize the importance of well regulated power. Textile machinery has such delicate manipulations to perform in bringing the fluffy fibers of cotton or wool from the tangled condition of the raw material in the bale, to the parallel and uniform layers of the roving, to twist this fragile cord into strong and even yarns, true to weight and number, and finally to weave these into the smooth texture of cloth of exactly the required weight, that uniformity in power and speed is the essential and indispensable quality in the prime mover. Water wheels or turbines driven by a stream of water constant in head and volume have this virtue in eminent degree. Besides, in the early history of this textile industry water power was not only abundant, but cheap, and it required a minimum of skilled attendance.

Necessarily then, textile machinery of the most intricate and ingenious kinds was developed in reliance and dependence on these qualities.

When the industries thus favored by natural sources of supply grew in geometrical ratio, the demand for power soon exceeded the volume of the rivers. Further increase in the output demanded new sources of power which must, however, possess the virtues named.

The steam engine had been developed and improved for more than half a century before the genius of Corliss found the rational way of governing the cut-off, thus achieving regulation and economy at one stroke.

Allow me here a reminiscence. My father bought the first Corliss engine ever installed west of the Allegheny Mountains, for his cotton mill in St. Louis. The price, more than twice that of a steamboat engine, at that time the acme of excellence in the west, seemed exorbitant. Corliss promptly agreed to take the steamboat price cash down, plus the saving in fuel for two years, but generously granted six months' option. Needless to say, before the end of the half year the balance of his original price was gladly paid.

This great advance in steam engine practice grew from the intelligent demand of the American cotton spinner. Further improvements followed, both in efficiency and capacity, until in 1876 the 1,400 horse power Corliss engine driving the machinery of the Centennial Exposition at Philadelphia, furnished the climax. But, meanwhile, Hirn in Mulhouse was proving the economy of superheating, ocean traffic demanded decrease in weight with increased economy, until the triple expansion engine and the refrigerating machine made it possible to bring meat from South America and Australia to feed the toilers of Europe. Finally, the electrical industries sprang up with ever increasing demands for cheap power and accurate regulation. They in turn made possible the transfer of energy from the mountain torrents to the distant cities of the plains. But, verily, "The appetite but grew by what it fed on" until the conservation of our natural resources has become the leading question in American politics; the first cost of water powers is rapidly rising; fuel economy is a more vital issue in every industry.

Thurston, born and bred in your New England hive of industry, after much careful experimenting with steam pressures up to 500 horse power and incisive mathematical analysis of his results, concluded in 1897 that in actual daily practice the best efficiency we can hope for from steam at

200	pounds pressure is	12	per cent.
500	pounds pressure is	14.2	per cent.
1,000	pounds pressure is	15.6	per cent.

of the energy stored in the coal.

By a curious coincidence it was in this same year that Diesel proved with his first 20 horse power internal combustion engine that 28 per cent. of the heat value of the kerosene he burned could be realized in actual power in the engine shaft. Early the following year, at the suggestion and risk of an American manufacturer, Diesel showed that his engine could accomplish the same results with the cheap American gas oil or fuel oil of commerce. Lord Kelvin, in a report on this new marvel, stated that "Diesel has actually obtained

58 per cent. more work than has been given from the same weight of oil by any of the best oil motors previously made."

The internal combustion engine dates back to the eighteenth century. In 1791, Street, in England, obtained a patent on an oil engine; a practical petroleum engine was built by Hock in Vienna in 1870; and a Boston yankee, Brayton, in 1872 built the first oil engine working at constant pressure but Dugald Clerk's test of it in 1878 showed only six per cent. efficiency. But Brayton was on the right path towards economy since he substituted a controlled gradual combustion for the explosive action on which all previous internal combustion engines depended.

The principle of Diesel's engine was entirely new as he uses no charge or mixture, but compresses only the air to support combustion, and then introduces the fuel under perfect control into this red hot air, maintaining constant pressure during combustion and expanding after the introduction of the fuel ceases, exactly as a steam engine does after cut-off. The economy thus secured, Diesel gave his attention to regulation and a few years later developed for this an extremely simple principle on which all later improvements in governing engines of the Diesel type are based.

While during the last decade great improvements have been made in internal combustion engines of the explosive type (witness only the marvelous development of the automobile motor), the natural limitations of explosive combustion where a mixture or charge is essential, have thus far prevented the accomplishment of accurate regulation.

It took fifty years of groping before Corliss by a brilliant stroke found the method and valve gear for a practical, variable cut-off controlled by the governor. And yet inventors during those years were dealing with large volumes of perfectly elastic steam. In his engine Diesel had to slice off a small disc from a mere thimbleful of a heavy incompressible liquid. Five years after his first engine was built he found the principle, and in a few years more his faithful assistants developed the mechanical means of perfect regulation. The American builders of Diesel engines confidently guarantee the speed regulation within two per cent., above or below the mean rated speed. For some years now Diesel engines have operated electric power plants in parallel not only with each other, but with water wheels and steam engines. In such cases the regulation is invariably left to the Diesel engine on account of its quick and accurate adjustment to changes of load. The economy, great as it was from the start, has been further improved, partly by increase in the thermal efficiency, partly by refinements in mechanical construction.

Thus, while in 1899 we could compare the Louisville Leavitt engine of 13.83 per cent. efficiency, and Rankin's ideal (theoretical) steam engine of 26.2 per cent. with a practical (though small)

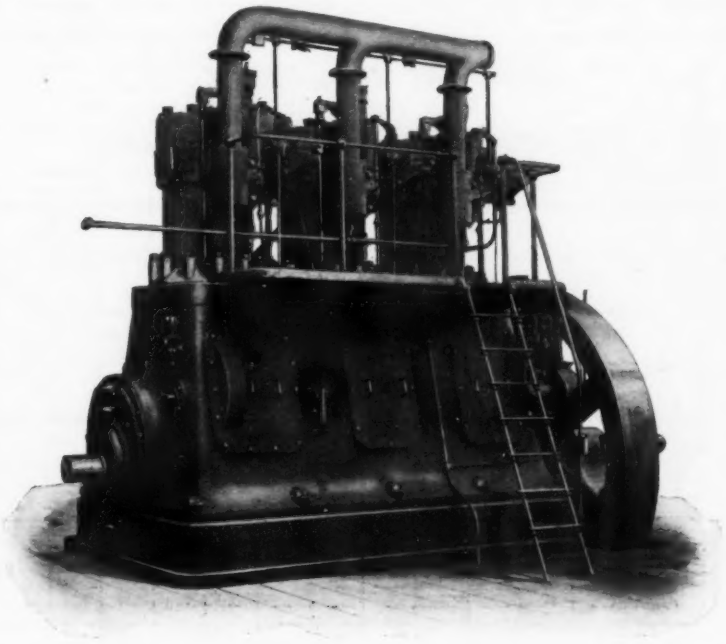


FIG. 1. AMERICAN DIESEL ENGINE, 225 H. P.

Diesel engine of 28 per cent.—our modern somewhat larger American Diesel engines exceed 30 per cent. efficiency.

The conservative guarantee adopted some years ago, that the consumption of fuel oil per 100 horse power hours of net work shall not exceed eight gallons that is 0.568 pounds per horse power hour, has been easily maintained and is now extended to cover running at any capacity between full rating and half load. This leaves a large margin to cover inferiority in fuel, in lubrication and in operating force. In actual duty trials on the Company's testing beds, much better results are obtained. The graph here shown gives the curve

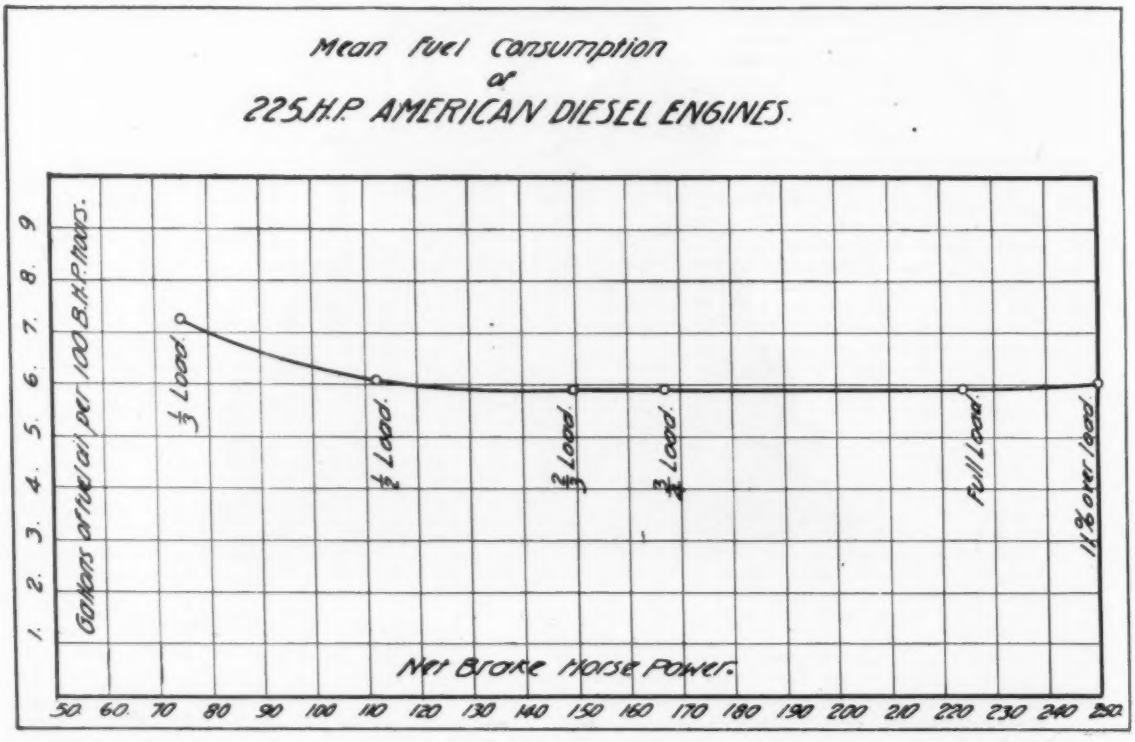

Mean Fuel Consumption
of
225 H.P. AMERICAN DIESEL ENGINES.
Gallons of fuel oil per 100 B.H.P. hours.
1. 2. 3. 4. 5. 6. 7. 8. 9
¾ Load.
½ Load.
⅔ Load.
⅓ Load.
Full Load.
11% over load.
Net Brake Horse Power.
50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

FIG. 2.

and an average price of 3 cents per gallon for the fuel oil. Then to get from your non-condensing engine the same economy as the Diesel, you must buy your coal for 39 cents a ton delivered on your grates in your boiler furnace; while if you have a good condensing engine you may pay as high as 62 cents a ton. If you live in a favored region where criminal waste has not yet exhausted the natural gas, you can reach Diesel power cost if you buy your natural gas for 19 cents per 1,000 feet at the gas valve of your gas engine; ordinary illuminating gas you must buy at 12 cents. If you use producer gas you must not pay more than $2.10 for hard coal or 72 cents for soft coal in your producer, including labor, and you cannot afford to pay more than $9.75 per horse power year for your water power, nor more than one-half cent per kilowatt hour for electric current.

of efficiency from 24 hour tests of six different engines of the 225 horse power type. At full load the average consumption was only 5.78 gallons (highest 5.94, lowest 5.59) per 100 horse power hours, at threequarter load 5.83, at two-thirds load 5.91, at half load 6.03, at one-third load 7.27, and at 10 per cent. overload 5.93 gallons

The curve is practically a horizontal straight line between full load and two-thirds, and rises but slightly at the ends.

You will naturally want to know what ratio these figures bear to those with which you now reckon your power cost.

Let us, for the sake of argument, allow that these figures will be exceeded in every day practice, and instead of 5.78 gallons take 6 1/4 as the consumption per 100 brake horse power hours,

The repair account of the Diesel engine is moderate. The average for 21 engines of the 225 horse power size, as reported by the owners, amounts to a trifle over 13 cents per horse power per annum, the records covering about four years' service. There are installed in the United States 162 Diesel engines aggregating 30,240 horse power; of these 47 engines aggregating 10,060 horse power are repeat orders, and 15 engines aggregating 3,010 horse power are in daily service in textile mills. The American Diesel Company has confined its work to stationary engines, but

keeps in touch with European licensees respecting other types.

Marine Diesel engines have been successfully developed in Russia mainly for oil tank vessels, in France for submarine boats, in Switzerland for passenger boats, yachts, and naval tenders, and in Sweden for auxiliary power for schooners and freight barges. The Polar exploration ship, Fram, is now being equipped with a 180 horse power Diesel engine. Last summer the French submarine fleet, all Diesel vessels varying in power 400 to 900 horse power, made a run from Brest via Cherbourg to Dunkirk and back a distance of 750 nautical miles, and delivered its successful attack on the battle ships in Brest harbor at the end of the run. French naval designers are now planning submarines each equipped with 1,400 horse power in Diesel engines. While heretofore these vessels were relied on merely for harbor defense, the Diesel engine makes them formidable agencies for attack on the high seas.

In Switzerland, on Lake Zurich, a small passenger steamer was last summer converted into a Diesel boat under the following conditions. The vessel steamed at best speed 8 3/4 miles per hour, while 11 1/4 miles was demanded. The Diesel equipment must not require more space or weight than the steam plant. This was accomplished with a saving of 35 per cent. in weight, a tenfold increase in fuel carrying capacity, and a reduction of fuel cost to one quarter that of the steam engine.

Test runs over a fifteen mile course showed a speed of 12 1/2 miles per hour, fuel cost 3 cents per mile, or 2.8 miles per net horse power. The fuel used was Galician crude oil, at $11.50 per ton, equivalent to 3.64 cents per gallon; the results figure to 0.541 pounds per brake horse power, or 27.8 cents per 100 brake horse power hours. It is thus shown that by giving up a fraction of the marvelous economy of the original Diesel engine, adopting the two stroke, a much lighter engine can be constructed.

On this basis a 1,200 horse power express locomotive is being built for the Prussian state railways, which is expected to be ready for tests late the coming summer.

In the marine engine and the locomotive the paramount consideration naturally was reduction of weight to a minimum. Therefore the two cycle type of engine was chosen with full recognition of the fact that no two cycle engine has ever reached the economic performance of the four cycle engine of the same type.

The performance of the Sulzer marine engine, 7.62 gallons fuel oil per 100 brake horse power hours, while much higher than the American tests above quoted, is still within the very conservative guarantee originally adopted. Further improvements of this type is to be expected from the collaboration of the Sulzers, Dr. Diesel and the Borsig Locomotive Works on the express locomotive. No doubt the final economic results will approximate more closely those of the four cycle engines.

When these experiences are later applied to stationary engines, an intelligent comparison covering all local conditions, will dictate the choice between the present engine of maximum economy and the lighter new type more suitable for large units, but with somewhat increased fuel consumption, just as it now does between the triple expansion steam engine and the modern steam turbine.

The Electric Drive as a Manufacturing Proposition.

MELDON H. MERRILL, 50 Congress St., Boston, Mass.

Without doubt, one of the most important achievements of electric drive to date, is that it has permitted the mill operator to make use of the steam turbine as a prime mover. This unit, of comparatively recent development, is most admirably suited for mill driving. It has no reciprocating parts, its motion being entirely rotary. It gives a continuous even pull at all times without angular variations, which is a very desirable feature in connection with mill power, the absence of which is one of the disadvantages in the reciprocating steam engine.

The turbine requires but little oil, and as this never comes in contact with the steam, the exhaust may be condensed and used for any purpose requiring clean, hot water. There is only one moving element, with the exception of the governor mechanism, and it therefore constitutes a unit of long life with practically no charge for up-keep. It also possesses ideal characteristics for intermittent service and variable loads, and provides a very desirable type of prime mover for auxiliary power. Its economy is always equal and frequently superior to the reciprocating steam engine and the plant can be installed at a somewhat less cost. The floor space required by this type of prime mover has considerable advantage over the reciprocating steam engine and gas engine. Also, the foundations required are of smaller dimensions, and economy can therefore be effected at this point as well as in the building.

The turbine may be operated at high vacuum permitting greater economy, and also presents a comparatively flat economy curve giving good efficiency over wide range of load. Steam turbines are now in common use in cotton mills and giving excellent results, as is evidenced by the number of repeat orders.

Within the past two years, low pressure turbines have played an important part in textile mill plants. By their use additional power has been obtained at a very low figure, thus permitting the continuance of and additions to existing power plants which without its use would have necessitated scrapping present apparatus and installing a new plant, or an additional unit with extra boiler capacity, all of which necessitates a greater outlay than the cost of the low pressure unit. All of these advantages in connection with turbine drive have been brought about by electric power, as the most efficient steam turbine, which is a high speed unit, is not suitable for belt or rope drive, but presents ideal characteristics for the application of electric drive.

The comparatively high speed of the turbine permits the use of a lighter and more compact generator, which in turn reduces the cost of the

latter to a point where the complete turbine set, comprising the steam turbine and its generator, may be obtained a a lower price than the reciprocating steam engine arranged for belt drive.

Another feature of great importance and wide application is the utilization of remote water powers for mill driving made possible by electric power. This has been of particular benefit to Southern mills. The South is rich in water power; many of these, however, are so located as to be of little or no use commercially, transportation facilities at these points being absolutely out of the question. By the use of electric transmission, a network of power lines has gradually spread over certain sections of the South and mills are now built at the most advantageous locations as regards transportation and labor. One of the hydro-electric companies in the South had a connected cotton mill load of about 66,000 horse power, 28,000 horse power having been added in the last twelve months,—a striking illustration of the growth of electric drive. This feature has been utilized to some extent in the North although, generally speaking, the water powers in this section represent an advanced stage of development. There are a number of hydro-electric power stations under construction at the present time which will transmit power over considerable areas to textile mill centers, for example, Fitchburg, Clinton and Northampton.

Coming to the mill proper. The early installations of electric power consisted of the "so-called" group system, many of which are in operation without change at the present time, and we owe a great debt to the men who took the first steps to adapt this power to commercial use in textile mills. Even today in some departments there is no better system than that presented by the original group drive, using one motor for a number of machines, it offering an inexpensive and simple method of utilizing electric power.

It is interesting to note just what has been done in connection with developing a suitable drive for the various processes.

PICKERS.

As outlined above, the picker drive was originally installed on the group system. The next step was to use individual motors for each picker, the motors being located on the ceiling with a belt drive to the pulley on the picker counter-shaft. The advantages of this drive were sub-division of power, absence of shafting, machinery located to better advantage, and confining any break-down or defect to one unit. The principal objection to this drive is the belt, which at best will give some slip with a consequent loss in production. The next step was to remove the uprights and counter-shaft on the picker and mount the motor direct on the picker frame, coupling its rotor to the beater shaft. This application was far superior to its predecessor, as it eliminated the belt with its expensive up-keep and loss in efficiency. The cost of this drive, however, was somewhat greater owing to the slower speed motor required to direct connect to the beater shaft, and also the coupling and supporting bracket for the motor. Some saving is effected by omitting the picker counter-shaft and uprights for which the manufacturers make a suitable allowance. This drive was further simplified by the use of a motor without shaft or bearings, the rotating element of the motor being mounted on the beater shaft similar to a pulley, the stationary part surrounding it and attached by suitable bracket to the picker. This arrangement effected a saving in first cost, the motor shaft, coupling, 2-bearings and housing being omitted. The application also requires less space. All of the above drives are in daily operation in various mills at the present time and are beyond the experimental stage. Each has its advocates, all three are good, the last mentioned, if properly installed, offering by far the best drive.

CARDS.

In the card room practically nothing has been done so far as the writer knows toward individual drive. The original group system is still retained in this department, the usual practice being to drive any number of cards from 75 upward from one motor. This is due largely to the low operating speed of the cards, which would, in order to obtain a satisfactory individual drive, necessitate a very slow speed motor, which, while giving excellent results, would make the cost prohibitive as the number of motors required is comparatively large. Carding being a continuous operation with practically no stops, except for grinding, does not present the attractive features for direct drive that obtains with some other processes.

DRAWING.

So far as the writer knows there are no mills using direct drive on drawing frames in commercial operation, the old group system still being in force for this work. Experiments have been made with the direct drive with good results, but on account of the cost of fitting up and the slight improvement resulting, the drive is not one that will be used greatly.

In fine mills using sliver and ribbon lappers and combers, the group drive is still retained, in fact, we believe no attempt has yet been made to apply direct drive to any of the above machines.

FLY FRAMES.

In this department, group drive has given way somewhat to the direct, the motor being connected to the frame by gearing or silent chain, the latter proving very satisfactory. Excellent results have been obtained by this drive. It has, however, been confined thus far almost entirely to extensions of existing plants.

MULE SPINNING.

Mule spinning is still a group drive proposition. The mule does not lend itself readily to individual drive, there being a great variation in the power required during its cycle of operation. For this reason, the group drive which allows these inequalities to lap over and be taken up by the entire system gives a more even and uniform load on the motor than could be obtained with individual drive. There are a few worsted spinning mills where

mules have been operated with individual motors with a belt drive somewhat similar to the original method as outlined in the picker drive. The practice, however, has not become general.

RING SPINNING.

The ring frames present greater opportunities for improvement in driving than any other machine used in the mill. While the group drive was for a long time in continuous service, it is almost ancient history as far as new installations are concerned. About five years ago, the success of individual drive was demonstrated and since then has been in quite general use, although not so much so as was hoped by its advocates and warranted by its merits. It is extremely gratifying in this connection to note the attitude of those who have given it a thorough trial under proper conditions. In these instances, in every case, so far as the writer knows, additional frames required from time to time have invariably been installed in this manner, one mill having given no less than five orders for these equipments, the smallest being for fifteen frames.

The first drives of this type were rather crude, the motor driving the cylinder through a set of gears. Much difficulty was experienced from broken gears and the noise was not conducive to additional equipments of this type. This drive was followed by the direct connected system which is now generally used, the motor shaft being of sufficient length to extend within the cylinder, the end bearing of the latter being omitted, that on the motor serving for both, with the motor set in as close as possible to the cylinder. This drive is less expensive than the geared type and far more satisfactory. With this system it is impossible to spin a wide range of counts, there being no means of changing the cylinder speed, which is the only objection that can be offered against this drive. Where a change in speed is necessary, the drive is now installed with a silent chain connecting the motor and cylinder, the change in speed being obtained by having pinions of various sizes to fit the motor. This is far superior to the geared drive in every way. It operates without noise, is flexible, has long life, and contrary to expectation, is not difficult to keep clean. With all of the above drives, the motor is mounted on a bracket bolted to the end of the frame and controlled by a special switch connected to the shipper handle of the frame. The advantages of this drive are now admitted and the cost seems to be the only reason for its not becoming more generally used.

For those who have tried and appreciate the benefits of electric drive and still wish to keep the original cost down, the so-called "four-frame" drive presents many attractive characteristics. With this drive, no shafting whatever is required. The motors are less in number but larger in size than with the direct system, thus affecting a material saving on the installation. The drive consists of mounting one motor on the ceiling with sufficient shaft extension on each end to accommodate two pulleys, four frames being driven by one motor. This eliminates nearly all of the friction load and gives a fairly positive drive. There is still the loss due to belt slip, but it is confined to one belt for each frame, there being no counters. This drive allows better sub-division of power, better control, steadier speed, absence of shafting and in fact, is in every way a step in the right direction, as compared with group drive. This drive has been used quite extensively for the past few years and is now in general use. Contrary to first thought, its cost is not prohibitive, in fact in some cases it costs less than the group system using several large motors. The following figures are taken from a large mill just built where both systems were considered, the four-frame drive being installed. The actual cost of both systems are from the figures submitted by the various contractors. The conditions were as follows:

Load to drive, 160 frames,
300 spindles each.

For the group drive, bids were received from contractors covering shafting, pulleys, hangers, etc., delivered and erected. To complete the drive, five 150 horse-power motors were required on which bids were received, delivered and erected. A combination of the lowest bids represented a cost of 22.4 cents per spindle for the 48,000 spindles required, including everything necessary, delivered and erected.

With the four-frame drive it was decided to install forty 20 horse-power motors operating at a speed of 1,150 revolutions per minute. The cost of these motors delivered and erected, taken from actual bids received, amounted to 18.9 cents per spindle, or a saving of about $1,680 in the spinning frame equipment. In this connection you will note that motors of 1,150 revolutions per minute were selected. In some mills, however, motors of 1,700 revolutions per minute have been used for this work, in which case the cost is somewhat less. In the mill just cited this would have made a material difference, as with forty motors at the higher speed, the equipment would have called for an investment of only 17.6 cents per spindle, or a saving of $625 over the installation as made, and a total saving over the group system of about $2,300.

The four-frame drive, while possessing distinct advantages over the group drive, was installed at a lower price. Not only was this true of the first cost, but also of the operating cost, there being less repairs and renewals on this system.

This drive does not compare in efficiency, flexibility and increased productive capacity with the individual spinning frame drive, and where spinning can be so arranged that certain frames are confined practically all the time to the same counts, the constant speed, direct connected motor as is used in a number of mills, is by far superior.

TWISTERS.

The foregoing in connection with spinning frames is equally applicable to twisters, except the four frame drive has not been so generally accepted with the latter. Many mills are now operating their twisters with perfect success with both the group and direct drive.

(Continued on Page 237)

Recent Textile Patents.

COMBING MACHINES. Construction of and means for actuating the dabbers of wool. 955,752. Charles V. Boys and John W. Tierney, London, Eng.

FABRIC SPONGING and Finishing Machine. 954,861. Adolph J. Hamma, Delawanna, N. J.

FABRICS. Tool for Patterning Piled. 954,483. Margit Urbantsek, Budapest, Austria-Hungary.

KNITTED FABRIC. 955,702. Robert W. Scott, Leeds Point, N. J.

KNITTING MACHINE. Circular. 953,248. Harry H. West, Plymouth, Pa.

KNITTING MACHINES. Automatic Cleaner for Latch. 954,932. Edward C. Cook, St. Johnsville, N. Y.

KNITTING MACHINE Needle. 954,174. John G. Egly, Philadelphia, Pa.

KNITTING MACHINE Pattern Mechanism. 953,122. Edgar C. Chandler, Philadelphia, Pa.

KNITTING MACHINES. Dial Holder for. 953,367. Harry Bradley, New Britain, Conn.

LOOM TAKE UP Mechanism. 954,172. Benjamin F. McGuiness, Worcester, Mass.

LOOM WEFT Stop-Motion Means. 955,212. Levi E. Salisbury, Providence, R. I.

LOOM HARNESS-HOLDING Device. 955,365. Walter H. Schull, New Brookland, S. C.

LOOM DOBBY. 955,559. Wm. H. Selley, New Bedford, Mass.

LOOM. Box. 953,275. William J. Lutton, Paterson, N. J.

LOOM SHUTTLE Changing Mechanism. 953,779. Oscar Cosserat, Amiens, France.

LOOM SHUTTLE. 955,548. Charles Rafferty, Fall River, Mass.

LOOM. Needle. 953,770. Carl Vorwerk, Leutesdorf, Germany.

LOOM. 954,450. Gedeon A. Menendian, Cleveland, Ohio.

LOOM for Weaving Textile Fabrics. Power. 955,211. Levi E. Salisbury, Providence, R. I.

LOOM-PICKER-SPINDLE Lubricator. 955,572. Thomas Ashworth, Urmston, England.

LOOM LET-OFF Mechanism. 954,648. Alonzo E. Rhoades, Hopedale, Mass.

LOOM STOP Motion. 955,030. Harry W. Williams, Danville, Ill.

LOOM for Weaving Bags. 953,632. Arthur L. Michael, Hopedale, Mass.

LOOM LET-OFF Mechanism. 953,664. Elbridge R. Holmes, Worcester, Mass.

LOOM. Filling Replenishing. 953,185. Edward S. Stimpson, Hopedale, Mass.

LOOM SHEDDING Mechanism. 954,181. Albert A. Gordon, Jr., Worcester, Mass.

LOOM SHUTTLE. 955,583. John V. Cunliff and Charles Rafferty, Fall River, Mass.

LOOMS. Cloth-Guiding Means for. 953,628. Ernest G. Gustafson and Thomas Duquette, Grosvenor Dale, Conn.

LOOMS. Jacquard Mechanism for. 953,379. Henry Deering, Providence, R. I.

LOOMS. Tension Device for Take-up Rolls of. 955,609. John Smith, Paterson, N. J.

LOOMS. Thread Cutting Mechanism for. 955,581. Augustin J. Chevrette, Worcester, Mass.

SPINNING APPARATUS. Traverse Motion for Yarn. 934,343. Alonzo E. Rhoades, Hopedale, Mass.

SPINNING MULE. 953,801. William D. Rundlett, North Andover, Mass.

SPINNING SPINDLE. 953,813. Carl Bergmann and Hans O. Kloetzer, Meissen, Germany.

SPINNING MACHINES. Waste Cleaner for Ring. 954,975. Richard Koref, Vienna, Austria-Hungary.

SPINNING FRAMES. Automatic Doffer for Fly. 954,688. Norman R. Newsholme, Keighley, England.

SPINNING MACHINERY. 954,012. Charles T. Atherton, Providence, R. I.

SPINNING and Twisting Machines. Doffer Guard for. 953,387. Rufus S. Matteson, Providence, R. I.

SHUTTLE. 955,119. Hector Le Doux and Eppa H. Ryon, Worcester, Mass.

TUBULAR RIBBED Fabric. 953,669. Edward E. Kilbourn, New Brunswick, N. J.

YARN MOISTENING Apparatus. 955,001. Paul Schilde, Hersfeld, Germany.

Recent Textile Trade Marks Registered.

"Lion Brand." Youth's and men's outer suits. The Feder, Silberberg Co., Cincinnati, O.

"Lupins Fabrics." Silk, wool, and cotton piece goods. Seydoux & Cie, Paris, France.

"Suskana." Cravats, neckties, etc. Susquehanna Silk Mills, New York.

"Newsboy." Hosiery. Harris-Lipsitz Co., Dallas, Tex.

"Whitall's." Rugs and carpets. M. J. Whittall, Worcester, Mass.

"Waverley." Silk piece goods. Kraft & Cutter, New York.

"Silkina." Handkerchiefs. Ottenheimer & Co., Chicago, Ill.

"Sonia." Girls' dresses. Louis Sonn & Co., New York.

"Excelsior." Cotton duck and sheeting. The Putnam-Hooker Co., Cincinnati, O.

"Utopia." Rugs. Bigelow Carpet Co., Clinton, Mass.

"Conderella." Cotton crepe. Hamilton Mfg. Co., Lowell, Mass.